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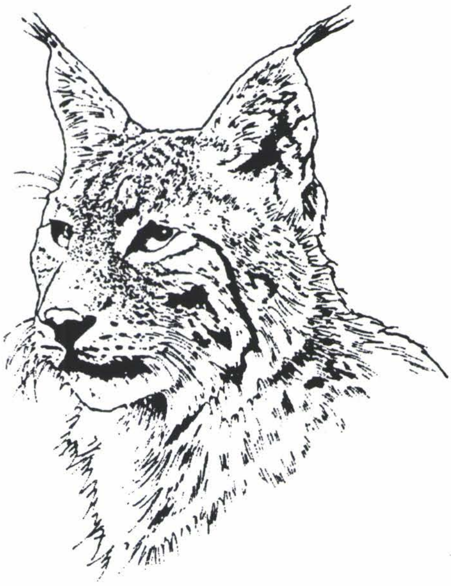
CANADA LYNX IN IDAHO PAST PRESENT AND FUTURE

CANADA LYNX IN IDAHO

Past, Present, and Future



Idaho Conservation Effort

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Background

The status of the Canada lynx (*Lynx canadensis*) in the lower 48 states has been a concern since 1982 when the U. S. Fish and Wildlife Service (FWS) designated the species as a potential candidate for listing as threatened or endangered. However, insufficient information prevented a judgement at that time. Lack of information about how commercial use and human encroachment have affected the lynx, and meager data concerning the general status of this secretive cat, has since prompted several environmental groups to petition the FWS for federal listing as endangered. . The National Wildlife Federation, Biodiversity Legal Foundation, and Defenders of Wildlife brought lawsuits against FWS in 1991, 1994, and 1996, respectively. In 1997, the FWS designated the population in the conterminous United States as warranted but precluded. A review by FWS is required on the anniversary of the decision. At that time any new data regarding the status, threats or other information will be included in the reassessment of this species.

Introduction

The purpose of this report is to present historical and current distribution information, and to identify and evaluate the issues and possible threats affecting Idaho's lynx population. This report will provide a framework for conservation of lynx in Idaho or for Idaho's involvement in regional conservation efforts.

Lynx in the conterminous United States are considered to be at the southern periphery of their range and only five studies have been conducted on lynx in the western United States, three in Montana and two in Washington.

> Koehler et al. (1979) radio-collared two lynx, one female and one male, while conducting a wolverine study in western Montana. Eight locations were collected on the female before she was found dead, possibly from mountain lion predation. The male was located 21 times in a seven and a half-month period; primarily in dense lodgepole pine (*Pinus contorta*) stands that evolved in the wake of the 1910 fire.

In the Garnet Mountains, east of Missoula, Montana, Smith (1984) radio-collared five lynx (three male, two female) and collected data on home range, movements, and habitat use. This information was used to evaluate interspecific relationships between lynx and bobcats inhabiting the same area. His results showed extensive home range overlap where the two species occurred sympatrically, although, lynx maintained larger home ranges. Overlap varied from 0 percent in the winter to 89 percent in the spring. No direct contact was observed, and separation appeared to be maintained through possible scent-marking stations and habitat preferences within the home range area. Lynx were primarily located in high elevation stands of subalpine fir (*Abies lasiocarpa*) throughout the year while bobcat were found primarily in Douglas fir-snowberry (*Pseudotsuga menziesii-Symphoricarpos albus*) habitat types in the winter and Douglas fir/pine grass (*Calamagrostis rubescens*) habitat types the remainder of the year.

Brainard (1985) studied the reproductive ecology of bobcat and lynx in western Montana. Also, he recorded home range data for three female and three male lynx (1 female and 1 male were recaptures from Smith 1984). Snowshoe hare (*Lepus americanus*) and mountain cottontail (*Sylvilagus nuttallii*), the primary prey, were not abundant in the study area and may explain the relatively large home ranges and extensive inter- and intrasexual overlap of home ranges where prey were localized.

In the 1980s, the Washington Department of Wildlife (WDW) initiated studies of Washington's three native cats: bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), and lynx. As part of that effort, Brittell et al. (1989) trapped 25 lynx in Okanogan County in north-central Washington to evaluate habitat use, movement and use of space, distribution and survival rates. Home ranges were calculated for eight male and seven female lynx. Male home ranges were not significantly larger than the females although daily travel distances varied between the two sexes. Resident lynx with the largest home ranges eventually emigrated from the study area, low snowshoe hare density may have prompted this movement. Home range overlap was greater between opposite sex animals and limited between animals of the same sex. Scent-marking was observed at the boundaries of home ranges. Lynx were active primarily at night (late afternoon until early morning) and had a tendency to avoid south and west facing slopes. There was no evidence of reproduction during the study among marked animals, although snowtracking indicated kittens accompanied unmarked females. The averaged mortality rate was 11.3%, three females and one male died from natural causes (starvation and predation).

Koehler (1990) continued the efforts initiated by the WDW focusing on the population characteristics and habitat use of lynx and snowshoe hare. He found lynx stayed above 1463m in lodgepole pine and Englemann spruce (*Picea engelmannii*)-subalpine fir cover types and snowshoe hare were most abundant in 20 year-old lodgepole pine stands. Wildfire suppression may be limiting the snowshoe hare population (by reducing foraging habitat) which in turn may explain the low density of adult lynx (2.3/km^2), high kitten mortality, and the relatively large home ranges of the five male and two female lynx radio-collared for this study.

There is an urgent need for more information concerning lynx at the periphery of their range. However, the high cost of in-depth studies and lack of funding remain prohibitive to obtaining this information. Management options increase if actions are implemented before populations reach critically low levels. Currently, managers must rely on information from Canada, Alaska, and the small foundation of data collected in Montana and Washington for developing management plans. Caution must be used when extrapolating from this pool of knowledge because ecological differences may exist among species populations. This may be especially true for species at the edge of their range. "Edge animals" may exhibit movements into atypical habitat and display behavioral traits uncharacteristic of animals at the core of the species' range, which enable them to persist on the fringe (Sunquist 1989).

Ewer (1973) observed that when we deal with something that is not only complex but also imperfectly understood, simplification tends to become distortion: what we do not know is necessarily omitted and the pieces we do know, naturally, expand to fill up the vacant areas in our picture. With so little solid information to go on we are left to assumption, speculation, postulation, and just basic guessing, much of which may be long on inspiration but short on validity. Because of the paucity of information relating to life history strategies for species at the edge of their range and the speculative nature of the information presented here, adaptive management must be used as new information becomes available.

Taxonomy

Cats have remained basically the same for 34 million years, however, their classification continues to evolve. The lynx is a member of the family Felidae, subfamily Pantherinae. This is where the consensus ends. Authorities disagree on lynx taxonomy at the generic and species level. Kratochvil (1975), Werdelin (1981), and Herrington (1986) recognized *Lynx* as a genus separate from *Felis*. Current genetic studies also define *Lynx* (includes bobcat (*Lynx rufus*), Canada lynx, Eurasian lynx (*Lynx lynx*), Iberian lynx (*L. pardinus*), and marbled cat (currently *Pardofelis marmorata*)) as separate from *Felis* (O'Brien 1997). However, van Gelder (1977), referring to hybridization data, argued that *Lynx* should not be separate, but included in *Felis*. O'Brien (1997) also classifies the Canada, Eurasian, and Iberian lynx as separate species, not conspecific. Werdelin (1981) agrees that *lynx* and *pardina* are separate species and supports Kurt■n and Rausch (1959) in defining *canadensis* and *lynx* as conspecific. However, Tumlison (1987) considers all three to be conspecific.

Description

The lynx is a medium-sized cat similar in size and appearance to bobcat. Lynx are distinguished from bobcat by their longer ear tufts, long cheek hair (facial ruff), a short, completely black-tipped tail (the bobcat's tail is longer and black only on the dorsal surface), and a lighter gray-brown coat that is less spotted than a bobcat. The most distinctive difference between lynx and bobcat are the large, furry feet of the lynx. Lynx paws are nearly twice the size of a bobcat (approximately the same size as a mountain lion's paw), are thermoregulatory, and represent structural adaptations to a snowy environment (McCord and Cardoza 1982). In unpacked snow the paw spreads and the surface area increases by more than 30% (Haglund 1966). Lynx are sexually dimorphic; the males are slightly heavier than females, weighing an average 10kg, while the average weight of a female is 8.5kg. Lengths average 85cm for males and 82cm for females (Quinn and Parker 1987).

Distribution

The lynx is Holarctic in distribution, inhabiting the boreal regions of Eurasia, the Iberian Peninsula in Spain, and North America. In North America, lynx can be found in most of Alaska and Canada, in northern New England, northern sections of the Lake States, in the Cascade Mountain Range of Washington and Oregon, and the Rocky Mountains of Idaho, Montana, Utah and Colorado (McCord and Cardoza 1982). These peninsular regions of the western United States support boreal forest habitats similar to those in Alaska and Canada and represent the southern margin of the lynx's geographic range (Koehler and Aubry 1994). Although historically rare in Wyoming, Utah, Colorado, and Oregon, lynx have been fairly common in the following ecoprovinces: the Thompson-Okanogan Highlands of north-central Washington, the Northern Rocky Mountain Forest in southwest Montana and northwestern Wyoming, and the Shining Mountains of northwestern Montana and northern Idaho (Koehler and Aubry 1994).

Historically, Idaho supported a stable lynx population in 8 of the 10 northern counties. Twenty-five to 30 animals were taken annually by trappers and hunters in this region (Rust 1946). Additionally, Idaho Department of Fish and Game (IDFG) records document lynx harvests from central Idaho in Blaine, Jerome, Lemhi and Valley counties and in southeastern Idaho in Bearlake, Caribou, Fremont, and Madison counties. Historical distribution and population estimates are difficult to determine because records (primarily trapping) were not maintained prior to 1977 when the lynx was classified as a predator. Under the predator classification only a hunting license is required to take an animal, and there is no requirement to report a kill. Additionally, large, light-colored bobcats or "blue" bobcats were referred to as lynx-cats or bay-lynx; therefore, historical records documenting lynx numbers probably included these animals and may be inflated. USFS records from 1941 estimated the lynx population to be about 600 animals in the 7 national forests of northern Idaho (Rust 1946). However, this record is probably overestimated due to the lynx-cat/bay-lynx designations. Nellis (1971) reported, from trapper reports of fur harvests, an average of 25 animals taken per year in Idaho from 1960-1970. Although, this number may also be inflated because trappers would record a lynx take if the fur traders classified the pelt as lynx-cat or bay-lynx. Lynx were reclassified from predator to furbearer in 1977 as a result of the Convention on International Trade of Endangered Species of Flora and Fauna (CITES). Consequently, a trapping season extending from January 1-31 was established. The season structure was changed to December 10-31 for the 1983-84 season and expanding to December 1-31 in the 1984-85 season. In December 1996, the Idaho trapping season was closed. IDFG records show 12 animals, from 7 different counties, have been taken since the reclassification. In addition, six lynx pelts were brought in for tagging, 3 in 1978 and 3 in 1979, which were taken prior to 1977. The most current records show 1 animal being trapped in both Idaho and Lemhi counties in 1991. Information collected for this report has provided additional information on lynx harvests and distribution throughout the state dating from the mid-1940s (Appendices A, B, and C). MAPS HERE

Management Status

Currently the lynx is classified as a furbearer in Alaska, Montana, Idaho (season closed in 1996), Minnesota (season closed since 1984), and North Dakota (season closed since 1981). Oregon classifies the lynx as a game species; however, there is no open season. In the Northeastern States, Michigan, and Wyoming it is protected; considered threatened in Utah and Washington, and endangered in Colorado, and Wisconsin. South Dakota designates the lynx as a nongame species. In Canada, all of the provinces allow harvesting except New Brunswick (endangered), Nova Scotia (closed season since 1980), and Prince Edward Island (endangered).

Habitat Requirements

Lynx require a landscape mosaic of forest habitats for foraging, denning, and travel. An uninterrupted forest community with low topographic relief and stands of varying ages is preferred lynx habitat (Koehler and Aubry 1994). Lynx observations in Pend Oreille County, Washington, which is adjacent to the Idaho border (west of Priest Lake), have placed animals in lodgepole pine communities half of the time, the remaining observations locate animals in western redcedar (*Thuja plicata*), and western hemlock- (*Tsuga heterophylla*) subalpine fir communities (Washington Department of Wildlife 1993). In the Okanogan Highlands of north-central Washington, the lodgepole pine community was the habitat most preferred by lynx (Brittell 1989, Koehler 1990). Smith (1984) found that lynx in the Garnet Mountains of Montana favored high-elevation subalpine fir forests.

Early-successional forests created by natural disturbances such as fire and disease, and man-caused disturbances such as timber harvesting, generate conditions favorable for snowshoe hare (Keith and Surrendi 1971; Conroy et al. 1979; Litvaitis et al. 1985; Bailey et al. 1986; Koehler and Brittell 1990; Koehler 1990, 1991; Wolfe et al. 1982). Lynx often focus their hunting activities along well-used hare runways and in localized pockets of hare activity, using the dense growth for stalking cover (Brand et al. 1976, Ward and Krebs 1985). In north-central Washington, dense regenerating stands of lodgepole pine about 20-25 years old provided optimal forage, hiding and thermal cover for hare and, thus, provide optimal hunting habitat for lynx (Koehler 1990).

There is very little published information describing lynx dens, although dense vegetation appears to be associated with documented dens (Table 5, page 2-22, Washington Department of Natural Resources, 1996). In north-central Washington, dense, mature forest stands with a high incidence of large woody debris (deadfall and blowdowns with exposed root wads) were preferred by female lynx for denning. Den sites were found in Engelmann spruce-subalpine fir-lodgepole pine stands that were ≥ 200 years old, with N-NE aspects and a high frequency of downed trees creating vertical and horizontal structural diversity that provided security and thermal cover for kittens (Brittell et al. 1989, Koehler 1990, Koehler and Brittell 1990). Optimal denning stands have minimal human disturbance, are in close proximity to hunting areas, and are at least 1 ha in size (Koehler and Brittell 1990). Late-successional stands also provide refuge from inclement winter weather and drought (Brittell et al. 1989).

Lynx tend to avoid large openings, natural or man-made (Koehler and Aubry 1994), making travel corridors an important component of lynx habitat. Travel corridors provide safe cover for lynx moving between den sites and foraging habitat within their home range. Suitable travel cover (coniferous or deciduous) has a closed canopy, is generally >2m in height, and is adjacent to denning and foraging habitat (Brittell et al. 1989). Lynx frequently travel along ridges and through saddles possibly because these routes may be easier, and allow lynx to spot potential prey from an elevated position (Staples 1995, Koehler 1990). Additionally, riparian zones may provide enough cover to function as a travel corridor.

When lynx densities are high, intense competition for food can prompt some animals (usually juveniles) to search out new territories with adequate prey (Mech 1980, Brainerd 1985, Ward and Krebs 1985, Slough and Mowat 1993). Conversely, when snowshoe hare numbers decline, lynx become nomadic and will travel great distances to locate adequate prey (British Columbia Ministry of Environment-no publication year, Ward and Krebs 1985, Quinn and

Parker 1987, Poole 1997). In either instance, lynx can be found in atypical habitats (Erickson 1955, Doll, et al. 1957, Rasmussen 1969). Movements into atypical habitats may be an important factor in the persistence of lynx at the southern margin of its range. These movements may allow lynx to survive during snowshoe hare population lows and may also facilitate gene flow (Koehler and Aubry 1994).

Home Range

Home range is an area that is used consistently by an animal and may encompass different microhabitats where an animal carries out day to day living. Home range estimates allow for comparisons between studies and provide managers with information concerning habitat preferences, which can be used to develop species management plans. However, caution must be exercised when making comparisons because of the variety of habitats, seasonal differences, calculation method, small sample size, and field techniques employed with different studies. Home range sizes can very greatly depending on food availability, season, and the sex and age of an animal (Table 1). In general, males tend to have larger home ranges than females and may encompass the home range of multiple females. There is usually limited overlap of home ranges between animals of the same sex. Dispersing sub-adults roam larger areas than established adults and at times will travel great distances to locate prey and a vacant territory (Saunders 1963a, Mech 1977). Established adults often increase their home range or abandon it altogether when hare numbers decline. Some researchers have found that lynx abandon their home range and become nomadic when the snowshoe hare density is <1.0 hare/ha (Ward and Krebs 1985, Kesterson 1988, Breitenmoser et al. 1993, Poole 1994). Atypical habitats, with a source of alternative prey, may be encompassed within an expanded home range and/or provide nomadic lynx with a temporary hunting ground in years when snowshoe hare are scarce.

Table 1. Home range estimates for adult Canada lynx in North America.

Location	Estimated Range (km^2)	Sex*	Method	Reference
Alaska	51 & 89	F(2)	?	Bailey et al. 1986
	783	M(1)		
Washington	9.3-116.8	F(7)	Harmonic mean	Brittell et al. 1989
	20.5-110.6	M(8)		
	8.5-87.9	F(7)	Min convex polygon	
	14.3-106.8	M(8)		
Washington	38 & 41	F(2)	Min convex polygon	Koehler 1990
	29-99	M(5)		
Minnesota	51 & 122	F(2)	Minimum area	Mech 1980
	145 & 243	M(2)		
Montana	16.1-62.3	F(3)	Minimum area	Brainerd 1985
	47.3-246.1	M(3)		
Newfoundland	15.5	F(1)	Snow tracking	Saunders 1963a
	18.1 & 20.7	M(2)		
Manitoba	138 & 177	F(2)	HP 9830 computer	Carbyn & Patriquin 1983
	221	M(1)		
Nova Scotia	18.6-32.3	F(1)	Map plotting	Parker et al. 1983
	12.3-25.6	M(1)		
Yukon	7.3-58.1	5F 6M (11)	Convex polygon	Ward & Krebs 1985
Northwest Territory	6.7-90.6	F[a]	Min convex polygon	Poole 1994
	2.7-68.1	M[a]		

* (N) = number of adults

[a] Home ranges were determined for 30 lynx: female;1989-90 (4), 1990-91 (10), 1991-92 (8), 1992-93 (2) and male;1989-90 (7), 1990-91 (13), 1991-92 (8), 1992-93 (2).

Prey

> The lynx "lives on rabbits, follows the rabbits, thinks rabbits, tastes like rabbits, increases with them, and on their failure dies of starvation in the unrabbited woods."
>
> Seton (1925)

Trappers and fur traders in the early part of this century were well aware that lynx populations fluctuated with the rise and fall of the snowshoe hare populations. Today, this predator/prey interaction is well documented in the available literature. Although there are four species in the northern boreal forest that provide sustenance for lynx during the winter (snowshoe hare, ruffed grouse (*Bonasa umbellus*), red squirrel (*Tamiasciurus hudsonicus*) and ptarmigan (*Lagopus* spp)), the snowshoe hare represents the bulk of the diet (van Zyll de Jong 1966). During the summer and fall when mice (*Peromyscus* spp.) and voles (*Clethrionomys* spp. & *Microtus* spp.) are no longer protected by a blanket of snow and hibernating mammals become active, lynx supplement their diet with additional species.

As snowshoe hare populations begin to decline and reach low levels, the surviving hare will retreat into pockets of optimal habitat (Wolff 1980). Lynx incorporate these scattered pockets of hare refugia into an expanded home range and focus their hunting activities in them. A larger home range with several prey pockets may reduce the possibility of exhausting the local food supply and reduces the amount of energy needed to obtain a meal by concentrating hunting activities in small areas (Ward and Krebs 1985). If hare populations become very low or are depleted, lynx become nomadic and their reliance upon alternative prey species increases (Table 2). On the island of Newfoundland, Canada, the lynx population expanded rapidly when snowshoe hare were introduced in 1864. At the turn of the century, when the snowshoe population "crashed", the lynx preyed upon caribou (*Rangifer tarandus*) and occasionally on arctic hare (*Lepus arcticus*), until the snowshoe hare population recovered. This lynx-snowshoe hare-caribou triangle continues today with the lynx alternating between the two prey species as their populations increase and decrease (Bergerud 1983). Although lynx are opportunistic and may take a variety of alternative prey, if the biomass consumed is less than the equivalent of one hare in a 24-hour period the lynx may eventually starve to death (Koehler and Aubry 1994).

Table 2. List of alternative prey and references.

Alternative Prey	**Reference**
Red squirrel (*Tamiasciurus hudsonicus*)	Van Zyll de Jong 1966, Brand et al. 1976, Quinn & Parker 1987, Koehler 1990, Staples 1993
Mountain cottontail (*Sylvilagus nuttallii*)	Brainerd 1985
Marmot (*Marmota caligata*)	Barash 1971
Columbian ground squirrel (*Spermophilus columbianus*)	Van Zyll de Jong 1966, Barash 1971
Richardson's ground squirrel (*Citellus richardsoni*)	Van Zyll de Jong 1966
Ptarmigan (*Lagopus* spp.)	Saunders 1963, Quinn & Parker 1987,
Caribou (*Rangifer tarandus*)	Saunders 1963b, Bergerud 1983, Stephenson et al. 1991
Mice (*Peromyscus* spp.)	Brand et al. 1976, Quinn & Parker 1987,
Voles (*Clethrionomys* spp. & *Microtus* spp.)	Saunders 1963b, van Zyll de Jong 1966, Brand et al. 1976, Quinn & Parker 1987
Deer (*Odocoileus* spp.)	van Zyll de Jong 1966, Quinn & Parker 1987
Fox (*Vulpes vulpes*)	Stephenson et al. 1991, O'Donoghue et al. 1995
Ruffed grouse (*Bonasa umbellus*)	van Zyll de Jong 1966, Brand et al. 1976, Quinn & Parker 1987
Dall sheep (*Ovis dalli*)	Stephenson et al. 1991
Beaver (*Castor canadensis*)	Saunders 1963b, van Zyll de Jong 1966
Flying squirrel (*Glaucomys* spp.)	Brand et al. 1976, Quinn & Parker 1987
Gray partridge (*Perdix perdix*)	Van Zyll de Jong 1966
Duck (*Anas platyrhynchos, A. carolinensis, A. rubripes*)	Saunders 1963b, van Zyll de Jong 1966
Passerines	Saunders 1963b, van Zyll de Jong 1966
Muskrat (*Ondatra zibethicus*)	Saunders 1963b
Moose (*Alces alces*)	Saunders 1963b
Arctic hare (*Lepus arcticus*)	Bergerud 1983

Snowshoe hare at the southern extent of their range do not appear to follow the "boom and bust" cycle characteristic of hare populations in Alaska and Canada (Brittell et al. 1989, Koehler 1990, Dolbeer and Clark 1975, Wolff 1980, 1982). Southern snowshoe hare populations appear to remain at levels similar to cyclic lows of their northern counterparts possibly due to the presence of competitors and predators that do not occur in the northern boreal forest. Red fox (*Vulpes vulpes)* goshawk (*Accipiter gentilis*), great-horned owl (*Bubo virginianus*), and lynx are the primary northern predators. In the southern latitudes, mountain lion, red fox, lynx, bobcat, coyote (*Canis latrans*), and several species of hawks and owls prey on snowshoe hare. Potential snowshoe hare competitors include jackrabbits (*Lepus* spp.) and cottontail rabbits (*Sylvilagus* spp.) (Koehler and Aubry 1994).

Because snowshoe hare have few predators and competitors in the north, when hare populations begin to increase some individuals are able to disperse into suboptimal habitats where they find enough forage and cover to survive and reproduce (Wolff 1980,1982). Recruitment from hares in the suboptimal habitat accelerates growth of the overall population. As the density steadily increases the available food is depleted and the population eventually "crashes." Competition for food by jackrabbits, cottontail rabbits, and possibly from deer (*Odocoileus* spp) and elk (*Cervus elaphus*) may be a factor in contributing to the noncyclic nature of snowshoe hare populations at lower latitudes. Additionally, noncontiguous habitat consisting of forest and open space increases the probability that dispersing juveniles will become easy prey for the numerous predators, which reduces the annual recruitment of individuals into the population (Dolbeer and Clark 1975). Thus, snowshoe hare densities in the Northwest do not often oscillate but commonly remain at low levels. This theory may also explain the low densities of lynx in the Northwest and throughout the southern range extensions.

Reproduction

Lynx in the western United States breed primarily in March and April, and after a gestation period of about 9 weeks, kittens are born in May and June. Kittens generally remain with their mother until about 10 months of age (Saunders 1963b, McCord and Cordoza 1982, Quinn and Thompson 1987, Koehler 1990). Productivity and recruitment are highly dependent on the density of snowshoe hare. During periods of snowshoe hare abundance, pregnancy rates for yearling and adult females can range from 33-79% and 73-92% respectively, however, when hare are scarce pregnancy rates can decline to 0-10% for yearlings and 33-64% for adults (Brand and Keith 1979, Quinn and Thompson 1987). Additionally, when hare numbers are low, kitten survival rates decline. In the Mackenzie Bison Sanctuary, Northwest Territories, Poole (1994) found during years of peak and declining hare densities, kittens constituted 43-49% of the population and had survival rates of 40-90%. However, the kitten survival rate dropped to 25% the first year of low hare densities. During the first year of declining hare populations in a study conducted in Yukon Territory, the proportion of breeding adults was 100% but dropped to 0 in the following 2 years when hare numbers declined to 1.1 hares/ha (Slough & Mowat 1996). In this same study, during peak hare years, kitten survival reached 75% for adult females but only 26% for kittens of yearlings (yearling females reproduced only during the 2 years of highest hare numbers). Other studies have observed similar results (Nellis et al. 1972, Brand et al. 1976, Brand and Keith 1979, Parker et al. 1983, Quinn and Parker 1987).

Information concerning kitten production and survival at lower latitudes is rare. From 20 carcasses collected in Montana, Brainerd (1985) found yearling and adult females had pregnancy rates of 44.4% and 100% respectively. Corpora lutea counts indicated ovulation rates of 4.28, and placental scars indicated average litters of 2.75. No kittens were observed with either of the 2 radio-collared, adult females but 2 juvenile males that were instrumented in February 1983, may have recently separated from their mother. In north-central Washington, adult survival rates were 71% (5 of 7) in 1986 and 100% in 1987. However, of the 8 kittens (from 3 litters) produced by 2 radio-collared females only 1 (12.5%) survived to winter (Koehler 1990). Combining information from Brittell (1989) and Koehler (1990), an average of 2 kittens survived each year from 1981-87. Although the data is limited, these figures are comparable with periods of low productivity in Alaska and Canada.

Mortality

In protected areas where fur harvesting is prohibited, starvation during periods of low snowshoe hare abundance appears to be the primary cause of natural mortality. Predation and cannibalism are additional causes of natural mortality but the incidence of either is uncommon (Koehler et al. 1979, Quinn and Parker 1987, Brittell 1989, Poole 1994, Slough and Mowat 1996). Natural mortality rates range from 0, when hares are plentiful, to 75% when hare numbers are low (Brand and Keith 1979, Ward and Krebs 1985, Bailey et al 1986, Koehler 1990, Poole 1994, Slough and Mowat 1996). Kitten mortality rates can be as high as 95% during periods of low hare numbers because females are more likely to feed themselves before providing food to their offspring (Brand and Keith 1979).

Emigrating animals that travel beyond refugium boundaries are often trapped just outside the refuge perimeter (Carbyn and Patriquin 1983, Ward and Krebs 1985, Poole 1994, Slough and Mowat 1996). Trapping was the single most important mortality factor for radio-collared lynx traveling outside the Kluane Game Sanctuary in southwestern Yukon Territory (Ward and Krebs 1985). During the course of the study, nine of the 11 radio-collared lynx traveled beyond the boundaries of the game sanctuary. Of that 9, trapping was responsible for 7 of 8 observed deaths (one of the two animals that was not trapped presumably died of starvation) and most were trapped within 2.5 months of the beginning of the trapping season. In another study in the same area, trappers harvested twenty-two of 25 radio-collared or ear tagged animals (88%) that emigrated from a protected refugium southeast of Whitehorse, Yukon Territory. (Slough and Mowat 1996). These animals were harvested between 10 and 1,100 km from the study area. Trappers with sets adjacent to Riding Mountain National Park, Manitoba harvested all 3 lynx instrumented by Carbyn and Patriquin (1983) when the animals moved outside the park perimeter.

Trapping is the leading cause of mortality for juvenile and adult lynx in unprotected areas (Mech 1980, Parker et al. 1983, Ward and Krebs 1985, Bailey et al. 1986, Koehler 1990, Poole 1994, Slough and Mowat 1996). Parker et al. (1983) estimated trappers harvested 65% of the lynx in their study area on Cape Breton Island, Nova Scotia during the 1979-1980 season. The mortality rate for radio-collared lynx (12) on the Kenai National Wildlife Refuge, Alaska totaled 90% for a 649-day monitoring period, which included 2 trapping seasons (44% in 1982-83, 86% in 1983-84) (Bailey 1986). Half of the 14 animals instrumented by Mech (1980) in Minnesota were either trapped or shot. Weaver (1993) compiled mortality data from field studies across North America and produced a summary of the fate of 85 radio-collared. Of the 42 known deaths where a cause was specified, 36 (86%) were trapping mortalities, 5 (12%) died of natural causes, and 1 (2%, does not include the reintroduction in the Adirondacks in New York) was hit by a vehicle.

During periods of low hare density, recruitment into the lynx population is depressed due to low productivity and increased kitten mortality (Brand and Keith 1979, Parker et al. 1983). Trapping mortality during these periods appears to be additive to natural mortality and may suppress lynx population increases even when snowshoe hare are increasing or abundant (see cites in Bailey 1986). Recommendations have been made for altering and/or closely controlling trapping seasons, and for maintaining refugia in wilderness areas or permanently assigned untrapped areas to prevent local extinctions and facilitate normal lynx populations responses to fluctuating snowshoe hare populations (Parker et al. 1983, Ward and Krebs 1985, Slough and Mowat 1996). Several provinces in Canada have initiated trapline quotas and have shortened the trapping season in some areas and closed it in others. The Lynx Management Guidelines for British Columbia (no year) offer suggestions to trappers for helping protect lynx populations; protecting remote refuges, minimizing the use of non-selective trapping methods, reduce trapping effort, releasing adult females, and practicing local habitat improvement.

Information regarding lynx mortality at the southern margin of their range is limited. Of the reported mortality for radio-collared, adult lynx in the conterminous United States, 7 died of natural causes (starvation, predation, undetermined), 13 were trapped or shot, and at least 18 reintroduced animals were hit by vehicles (Koehler et al. 1979, Mech 1980, Smith 1984, Brainerd 1985, Brittell 1989, Koehler 1990, R. Brocke per. comm.). Only one study (in the conterminous U.S.), Koehler (1990), has documented information concerning kitten mortality; 7 of 8 kittens (87.5%) from 3 litters produced in 1986 and 1987, did not survive to winter. In Montana, 2 juvenile radio-collared males died of natural causes during their first winter (Brainerd 1985).

Currently, the trapping season in Idaho is closed. However, incidental lynx takes during bobcat and coyote trapping seasons may be cause for concern, especially with low-density lynx populations.

Lynx Interactions with Other Predators

Lynx interactions with other predators at the southern periphery of its range is likely different than in its core range of Canada and Alaska because of the fragmented nature of potential lynx habitat here and the presence of more facultative predators and potential competitors of both lynx and snowshoe hares. Intra- and interspecific interactions likely take the form of resource competition (the same or different species utilizing a common resource that is in short supply) or interference competition (the same or different species harm one another in seeking a resource that may or may not be in short supply) (Birch 1957). This could involve competition for a scarce snowshoe hare or other prey resource between lynx, bobcat (*Lynx rufus*), fisher (*Martes pennanti*), marten (*Martes americana*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), and larger raptor species, or direct predation and spatial displacement by mountain lion

(*Felis concolor*), wolf (*Canis lupus*), coyote, or wolverine (*Gulo gulo*).

The predator guild that preys upon snowshoe hares in the northern boreal forest consists of lynx, red fox, goshawk (*Accipiter gentilis*), and great-horned owl (*Bubo virginianus*). In that region lynx, goshawk, and great-horn owl are obligate, migratory predators that all exhibit a delayed density-dependent cycle with snowshoe hares, resulting in a relaxation of predation pressure after snowshoe hare populations have crashed (Koehler and Aubrey 1994). Conversely, the guild of predators on snowshoe hares and other sympatric prey in the western mountains are mountain lion, bobcat, coyote, red fox, and several species of hawks and owls, along with the lynx that may be there. These other predators are facultative and resident, and their populations do not cycle in response to hare numbers (some of these predator populations do, however, fluctuate in response to prey base changes). The presence of these predators at stable densities prevents snowshoe hares from becoming established in suboptimal habitats and thus increasing the hare population size and density (Dolbeer and Clark 1975; Wolff 1980, 1982). Predation upon snowshoe hares by this diverse assemblage of mammalian and avian predators may then contribute to increased mortality and reduced hare populations, that in turn could limit the availability of prey for lynx and thus limit lynx populations (Keith et al.1984, Boutin et al. 1986). Additionally, no other species of leporid occupies the northern boreal forest; thus, the presence of potential competitors such as jackrabbits (*Lepus* spp.) and cottontails (*Sylvilagus* spp.) in the western mountains may also limit snowshoe hare populations (Aubrey and Keith 1994), but they may also provide optional prey species for lynx.

There is little direct information on the extent or causes of natural mortality in lynx, of which predation is one cause. Wolves have been noted to kill lynx (Iurgenson 1955 *in* Hatler 1988; Pulliainen 1965, Banfield 1974). Koehler et al. (1979) reported a radio-collared female lynx that died as a result of apparent predation by a mountain lion, and Koehler (1987) attributed the loss of a radio-collared adult male to predation, although the predator was not specified. In Alaska, a wolverine killed a lynx in a livetrap (Berrie 1974) and Slough and Mowat (1996) noted 2 radio-collared lynx killed by wolverines in Yukon. Lynx also prey on other lynx (Poole 1994, Slough and Mowat 1996). Based on snow-tracking, Elsey (1954) reported an incident wherein a large lynx pursued, caught, killed, and partially consumed 1 of 2 "young" lynx. However, the fact that infanticide or cannibalism seems common in carnivores and may play a role in the population regulation of some felids (Keith 1974), it has not been demonstrated to be an important factor in the regulation of lynx populations (Quinn and Parker 1987). With the collapse of the snowshoe population in the boreal forest of the Yukon, many predators killed other predators. Lynx, wolves, coyotes, and wolverines killed lynx. Lynx killed red foxes, and great horned owls killed other raptors like goshawks (O'Donoghue et al. 1995).

Different behavior patterns, foraging strategies, habitat use, and population densities may limit some competitive interactions between lynx and other predator species, particularly in winter (McCord and Cardoza 1982, Knowles 1985, Kruuck 1986, Major and Sherburne 1987, Litvaitis and Harrison 1989, Murray et al. 1994, Murray et al. 1995). The paws of lynx are large enabling them to traverse deep snow easily. Lynx paws can support about twice as much weight on snow as those of a bobcat (Parker et al. 1983) and 4.1 - 8.8 times that of coyote paws (Murray and Boutin 1991). This would allow lynx to exploit high-elevation areas where deep snow would generally exclude bobcats and coyotes (McCord and Cardoza 1982, Parker et al. 1983, Koehler and Hornocker 1991, Murray and Boutin 1991, Brocke et al. 1992). However, increased access to high-elevation habitats via snowmachine trails and roads maintained for winter recreation or forest management activities may allow more use of these habitats by bobcat and coyote. Increased competition from other predators may be particularly detrimental to lynx during winter months when hare numbers are lowest and lynx are nutritionally stressed (Koehler and Keith 1994). Litvaitis and Harrison (1989) suggested that with the limited prey base available to bobcats and coyotes in eastern Maine, any snowshoe killed by a coyote would probably influence the subsequent availability of hares to bobcats.

Forest Management Practices

Koehler (1990) and Koehler and Brittell (1990) reported that lynx do not hunt in open areas more than 300 feet across with little or no cover. Therefore, large block clear-cuts inhibit lynx hunting and create barriers to lynx movements (Koehler and Aubry 1994). However, Koehler and Brittell commented that providing narrow areas in irregular clear-cuts would help offset negative aspects of clear-cutting. The same issues would likely apply to diameter class, seed tree, and shelter wood silvicultural prescriptions. Koehler and Brittell (1990) reported that lynx prefer an overstory at least 6 feet in height for travel corridors. Topographically, travel corridors are frenquently through saddles and along ridges (Koehler and Brittell 1990). However, Koehler and Brittell (1990) and Koehler and Aubry (1994) write that logging and fire are essential to maintain foraging areas for lynx prey, principally snowshoe hares. They caution the treatments should be kept small and be carefully planned.

Koehler (1990) and Koehler and Brittell (1990) report that lynx travel through stands silviculturally thinned to 180 trees per acre with little shrub understory. Thinning to this level approximates a 16 by 16-foot spacing between trees. This implies that shelterwood, seed tree, and diameter class cuts would likely have the same impact as clear-cuts to lynx.

Prescribed burning in old growth spruce/fir habitats that reduces the amount of down woody material used by lynx kittens as escape cover would likely have an adverse impact on lynx denning habitat. Prescribed burning in ponderosa pine or other more xeric forest types may not have the same impact on lynx denning habitat. Prescribed burning could also be used to create the lower successional stages used by lynx prey.

Impacts of Logging Western Forests on Lynx Prey

Snowshoe hare

Opening closed forest canopies can enhance habitat for a variety of wildlife species by creating areas with more palatable grasses, forbs, and browse (Gullion 1970, Conroy et al. 1979). Koehler and Brittell (1990) wrote that the benefits of opening the forest canopy include increased herbaceous species for forage in spring through fall for the first few years (1-6 years) until the canopy closes (from age or density), then the stand provides browse for the winter in the form of lodgepole pine saplings that are above the snow (7-30 years). During the winter snowshoe hares made high use of the edges of clear-cuts nearest cedar-fir community and made little use of the center of clear-cuts and forest without much shrubby understory in Michigan (Conroy et al. 1979). Conroy et al. (1979) concluded that clear-cuts for snowshoe hares should be small (0.5 to 10 acres) and have canopy cover that is within 650 - 1300 feet of all parts of the clear-cut. Clear-cuts needed to be interspersed with areas having a dense understory and canopy coverage for security and thermal habitat needs.

As winter habitat clear-cuts can be harmful to snowshoe hares for the first 6-7 years or until browse remains above the snow level (Koehler and Brittell 1990), but slash piles if left unburned provide some winter habitat for snowshoe hare in Michigan (Conroy et al. 1979). Many deciduous shrubs (willows, alder, and other) resprout vigorously after disturbance and may provide suitable winter browse habitat in less than 5 years. In Washington Koehler (1991) found that lodgepole pine forests less than 50 years of age received the bulk of the winter snowshoe hare use. Koehler and Brittell (1990) noted that opening the forest canopy enhances habitat to prey species from 8 to 30 years if stand density is high. Koehler and Brittell (1990) commented that logged and thinned stands should be less than 40 acres in size, irregularly shaped and have several areas no more than 300 feet across.

Thinning some stands (30+ years) may initially benefit snowshoe hare habitat (Sullivan and Sullivan 1988, Koehler and Brittell 1990, Koehler 1991). But Sullivan and Sullivan (1988) noted that the increase was for less than 1 year and over the long term snowshoe hare numbers were less than on the control. Additionally, snowshoe hares avoid recent clear-cuts or heavily thinned stands until the vegetation attains sufficient cover height of 6 to 10 feet (15-25 years) (Sullivan and Sullivan 1988).

Adams (1959) noted that snowshoe hares used a slash pile for a nursery for young. Conroy et al. (1979) noted that winter snowshoe hare activity was centered around slash piles at the edges of clear-cuts and recommended that some slash be left on site especially near the edges.

Voles

Red-backed voles increased following clear-cut logging in the Appalachians (Kirkland 1976, Merrit 1981). However, in western Wyoming, Campbell and Clark (1980) found that vole numbers did not change compared to an unlogged control following selective logging, but clear-cuts resulted in a decline in red-backed vole numbers with an increase in deer mouse numbers. The deer mouse numbers increased in the 8-month period following the clear-cut, which Campbell and Clark (1980) attributed to xerification of the logged area. Voles have been observed using slash piles as habitat for nests and wintering.

Red Squirrel

Krull (1970) reported that clear-cutting mixed hardwood/coniferous forests in NewYork resulted in a 30% decline in red squirrels. However, in Idaho in coniferous forest Medin (1986) reported that red squirrel densities in a diameter cut (10+ dbh) decreased more than 80% compared to unlogged plots, and the few red squirrels that remained were found in uncut patches. Medin (1986) commented that the removal of snags and large woody debris might have reduced habitat suitability in the logged areas. In Medin's (1986) study the slash was lopped, scattered and burned. Slash piles near the uncut edge may be used by squirrels for escape cover or as middens in some cases. Rothwell (1979) suggests that suitable red squirrel habitat contains clumps of conifers with interconnecting canopies for nest trees. His research suggests that clear-cuts, seed tree cuts, and shelterwood cuts may adversely impact the habitat adjacent to nest trees. Impacts to red squirrels from selective logging and clear-cutting are poorly documented in Montana, Wyoming, Idaho, Utah, and Colorado.

Ground squirrels and Marmots

There is evidence that ground squirrels will colonize openings created by clear-cut logging in dense forest (Tevis 1956). Specific impacts of other silvicultural prescriptions on ground squirrels were not located. The use of rodenticides to reduce depredation of tree seedlings by ground squirrels in cold forest sites could potentially be detrimental to lynx.

Spruce grouse

Impacts of overstory removal for spruce grouse are not well researched. Johnsgard (1983) commented that logging in the late 1800s and early 1900s is suspected of eradicating spruce grouse populations in some areas. In Michigan Robinson (1969) stated that clear-cutting on a rotating basis would probably perpetuate favorable spruce grouse habitat as the cut areas regenerate. However, his data indicates that other timber harvest methods (selective cut, shelterwood, or seed tree cuts) may also provide adequate habitat for spruce grouse if young trees become established and a shrubby understory is regenerated. Robinson (1969) also commented that spruce grouse avoided conifer stands with closed canopies, limbs high off the ground, and bracken fern understories as well as grassy openings. Robinson did not specify any size ranges for manipulating habitat for spruce grouse.

Ruffed grouse

Sharp (1963) and Berner and Gysel (1969) mention that small openings (.25 to 1 acre) in forest benefitted ruffed grouse with broods. Gullion (1970) stated that cutting all mature aspen from forested tracts 40 acres or larger is an almost certain way to eliminate overwintering and breeding ruffed grouse. However, he also states that the best ruffed grouse habitat is a mix of aspen stands between 3 and 9 years old for broods and 10 and 30 years of age for adults. Berner and Gysel (1969) recommended keeping about 10% of the habitat in openings and recutting areas in 40-year rotations. In southeast Idaho Stauffer and Peterson (1985) recommended that mature (>80 years) aspen stands be cut to create early successional stages in these communities, however, some mature aspen need to remain to provide winter food (Doerr et al. 1974). Gullion (1970) commented that burning slash benefits ruffed grouse habitat by reducing the hunting cover of mammalian predators. However, slash has been documented to serve a cover for nesting ruffed grouse.

Gullion (1970) commented that wind storms and small fires impacting a few acres are beneficial to ruffed grouse, but major alteration of forest cover larger than 10 contiguous acres will reduce the density of ruffed grouse for several years. Doerr et al. (1970) documented the impacts of large spring fire (2,500+ acres) resulted in a 75% decrease in drumming males over a 2 year period. One-third (20) of the drumming logs were destroyed and of these 14 drumming territories were abandoned (Doerr et al. 1970), probably because of the loss suitable drumming logs. Where the drumming logs were not destroyed the territories were active once shrub cover reestablished (year 2).

Blue grouse

On Vancouver Island once the coniferous forest canopy approached 75%, blue grouse populations begin a rapid decline (Redfield et al. 1970). Redfield et al. (1970) reported that logging including clear-cuts play an important role in maintaining brood habitat for blue grouse in that study area. However, they mentioned suitable winter habitat at higher elevations had not been logged. For blue grouse burning slash following logging did not change the number of territories by males, number of nests, nest success, or brood survival when compared to areas where slash was not burned (Redfield et al. 1970). In Montana Martinka's (1972) research suggests that diameter class timber harvest may be compatible with blue grouse habitat. He documented that dense conifer thickets of 0.2 acres in size with average tree size of 4.9 inches dbh were important areas for roosting and escape cover for blue grouse. Martinka (1972) also reported that several small thickets would provide the same benefits as one 0.2-acre thicket. However, Martinka (1972) cautioned that small isolated thickets were rarely used. The thickets had about 1,200 stems per acre. Martinka (1972) wrote that selective logging was superior to clear-cuts. Selective logging benefits blue grouse by opening up the canopy and allowing new scattered thickets to be created. However, he commented that two negative side effects of selective cuts could be damage to existing thickets by skid trails and spur roads and the creation of large areas of slash which male blue grouse avoid. Clear-cuts would remove all the thickets and create more slash. Stauffer and Peterson (1985) stated that cutting openings in dense coniferous forest stands could create potential blue grouse breeding habitat.

Threats to lynx habitat

1. Large wildfires like those in 1995 on the Boise and Payette National Forests are likely detrimental to lynx habitat because of the scale of burned area, further fragmentation of habitats, and disruption of travel corridors.
2. Poorly planned timber sale layouts that eliminates connectivity, creates large blocks of relatively even aged stands of timber, or eliminates necessary denning habitat for lynx. Planning should also consider natural openings and recent fires.
3. Prescribed fire that "over achieves the objective" (i.e. escapes) or eliminates specific features (fallen logs) in lynx denning habitat. Historically, some forest types did not burn frequently.

Impacts of Idaho Forest Practices Act

The Idaho Forest Practices Act was established to provide uniform minimum standards for conducting forest practices that will maintain the productivity of forest land and minimize soil and debris entering streams and protect wildlife and fish habitat. The term “Forest Land” is used to mean federal, state and private land growing forest tree species that could be used in the manufacture of lumber of other forest products. A forest practice is described as: the harvesting of forest tree species; road construction associated with harvesting of forest tree species; reforestation; use of chemicals or fertilizers for the purpose of growing or managing forest tree species; the management of slashings resulting from harvest, management or improvement of forest tree species or the use of prescribed fore on forest land. Attainment of the overall goals of the Idaho Forest Practices Act is achieved by use of Best Management Practices. As used in this context, a Best Management Practice is a practice or combination of practices thought to be the most effective and practicable means of preventing or reducing the amount of nonpoint pollution generated by forest practices. A representative sample of the component practices is evaluated on a periodic basis using a monitoring feedback loop to determine if the set of practices used kept nonpoint pollution below described levels and supported any designated beneficial uses for streams in the action area.

Forest thinning blocks are to be no more than 80 acres in size and at least 6 chains (400 feet) apart. Areas thinned will likely have to have slash managed to reduce the fire hazard to less than 80 points. Thinning could enhance habitat for prey used by lynx. The width between thinned areas may provide adequate winter habitat for prey and travel corridors for lynx depending upon the tree density of the forest type, understory and canopy coverage.

Reforestation guidelines for acceptable minimum stocking, a 15 x 15 foot spacing for seedlings (<200 trees per acre at 2.9 inches in dbh or less), in the Idaho Forest Practices Act generally do not meet the habitat criteria for woody stem density required by wintering snowshoe hare, spruce grouse or ruffed grouse habitat which exceed 2,000 stems per acre in patches. Additionally, areas with high numbers (1000+) of small diameter trees are assigned high hazard point for slash management if thinned in the future. Once the trees exceed 6 feet in height, this density does meet lynx travel corridor requirements.

In coniferous forests, stream protections zones, particularly Class I zones, may provide for limited habitat and travel corridor for red squirrels, porcupines, voles, and winter habitat for spruce and blue grouse. Class I streams are used for domestic water supply or are important for the spawning, rearing, or migration of fish. The minimum tree density in Class I zones varies from 116 to 155 trees per acre depending upon tree diameters based upon the minimum standing trees per 1000 feet. This does not meet the recommended 180 trees/acre for lynx travel corridors (Koehler and Brittell 1990). If aspen is also present in the protection zone, ruffed grouse may also benefit. Depending upon the understory, this may help meet the needs of snowshoe hares. Class II protection zones are likely to provide less value as habitat for prey species and lynx. Class II streams are usually headwater streams or minor drainages that are used by only a few, if any, fish for spawning or rearing. The value of these stream protection zones also depends upon the understory and overall landscape. If existing federal guidelines require more trees in riparian buffer zones, those requirements may meet lynx habitat needs.

Timber Slash Management

Of principal importance to the issue of wildland fuels management and fire hazard reduction is which agency or entity assumes the liability for fire suppression costs. The reduction of the fire hazard resulting from additional fuel loading with slash is managed by two slightly different procedures, dependent on whether the slash is from a non-commercial or commercial venture. The fuel and debris, which results in no removal of a commercial product, is managed under regulations pertaining to the Idaho Forest Practices Act. Fuel and debris resulting from removal of a commercial product is managed under regulations pertaining to forest fire protection as set forth in the Idaho Forestry Act, title 38, chapters 1 and 4. All fire hazards that are created are the responsibility of the landowner. The landowner must make the choice to assume fire protection responsibilities or contract with the Idaho Department of Lands fire control organization. With the exception of scattered public lands managed by the Bureau of Land Management in north central Idaho, the federal land management agencies with forested lands provide their own fire protection. Fire protection measures provided by the federal agencies meet their own internal fire protection guidelines, which have been coordinated with the State Fire Warden. A fire hazard analysis for forest management practices on federal land is expected to meet the appropriate conditions contained in that agency's fire management plans.

Slash management is essentially the reduction of the risk of fire. The Idaho Forest Practices Act requires that the total hazard points be less than 80 for an area. Hazard points are based upon a variety of factors including stem density, tree species, slope, aspect, size of the area, and other factors. There are a number of options are available to reduce the hazard points including constructing fuel breaks, fire trails, burning or removal of slash, and modification of slash crushing, chipping, or lopping.

Shrub-Steppe Habitats

The synchronous nature of lynx and snowshoe hare population dynamics in the Canadian and Alaskan boreal forests is well documented. In the southern part of their range, snowshoe hare populations do not appear to be cyclic, but rather mimic hare population lows in Canada (Koehler and Aubry 1994). Assuming lynx population densities reflect snowshoe hare population densities, it is logical to conclude that in the conterminous United States lynx would also occur at relatively low, stable densities in a narrow range of habitats.

In spite of relatively stable low density snowshoe hare populations, lynx populations in Idaho occasionally experience fluctuations more typical of northern populations only on a much smaller scale (Appendix A). In 1972, 6 lynx were harvested with 5 being in habitats thought to be atypical. One and possibly 2 additional lynx were confirmed in northern Utah during the same year (Lynx occurrence data, Utah Natural Heritage Program 1997). The number of lynx harvested in a relatively short period of time in the southern part of their range appears to be significant relative to the total number of animals documented in these areas, and may be indicitive of the vulnerability of lynx to harvest in these atypical habitats.

Lynx densities in Canada and Alaska range from a high of about 45/100 km^2 to a low of about 1-2/100 km^2 (insert references). Anecdotal information from the Stanley basin between 1959 and 1966 suggests lynx densities of about 7/100km squared. This density would be difficult to explain based on the premise of low-level stable snowshoe hare populations. Lynx are documented using alternate prey sources in boreal habitats (Van Zyll de Jong 1966, Marty 1995). Either because of the quantity or the energy expenditure in capturing alternate prey, there is no evidence that these prey sources do anything more than maintain older adults, the vitally important breeders, in existing populations (Poole 1994).

Seventy-four percent of the lynx designated as confirmed specimens or sightings are from the Salmon, Upper Snake, and Bear River watersheds (Appendix B). Vegetative plant communities in these watersheds are typically comprised of a mosaic of timbered areas and areas dominated by shrubs, the most prominent being sagebrush (*Artemisia spp.).* In some areas, sagebrush plant communities are nearly contiguous from valley floors to near timberline. On Lemhi and Bannock Passes, for example, contiguous sagebrush extends from valley floor to valley floor, across the Continental Divide. Within the Upper Salmon River and Upper Snake River watersheds there are very few points within the landscape that are more than a few miles from sagebrush habitat. Due to their large home ranges it is likely that lynx regularly encounter this habitat within these watersheds.

High elevation (>7,000') shrub-dominated plant communities in Idaho are largely comprised of mountain big sagebrush (*Artemisia tridentata vaseyana)* or low sagebrush (*Artemisia arbuscula*) (R. Rosentretter pers.commun.). These habitats appear to be used either exclusively by snowshoe hares or by both snowshoe hares and white-tailed jackrabbits (*Lepus townsendii) (*Braun and Streeter 1968, Groves et. al. 1997*).*

Mountain big sagebrush is the most common shrub in mid-elevation (5,500'-7,000') shrub-dominated plant communities. White-tailed jackrabbits can at times dominate these areas and at other times white-tailed jackrabbits occur sympatrically with black-tailed jackrabbits. Low-elevation (<5,500') shrub dominated plant communities are largely comprised of Wyoming big sagebrush (*Artemisia tridentata wyomingensis)* with black-tailed jackrabbits (*Lepus californicus)* being the main leporid with few or no white-tailed jackrabbits. Elevation appears to play a key role in the distribution of black-tailed jackrabbits and snowshoe hares over the landscape. White-tailed jackrabbits appear to coexist with black-tailed jackrabbits at the upper elevational ranges of black-tailed jackrabbits (Groves et.al. 1997).

Very little is known about the white-tailed jackrabbit in Idaho. It has been found in areas utilized by lynx (R. Wenger pers.commun., B.Aber pers.commun.). Anecdotal information suggests that white-tailed jackrabbits undergo periodic population fluctuations synchronous with black-tailed jackrabbits. Lynx have been known to utilize other leporids when the opportunity presents itself (Bergerud 1983, Brainerd 1985). Anecdotal information exists of lynx in or proximal to areas that were currently experiencing or recently experienced black-tailed jackrabbit population density peaks. There may actually be some metabolic efficiencies for lynx in the use of jackrabbits as a prey item as the result of their larger size (need a reference here that refers to lynx metabolic needs or prey biomass requirements).

There are a number of hypotheses regarding lynx behavior that could explain lynx use of jackrabbits as a prey resource. All may be true at one time or other and will likely depend on prey density, prey location, and behavioral differences between individual lynx. Six such hypotheses based at least in part on anecdotal information are described below.

H1. Lynx follow jackrabbit population highs into habitats many miles from where they are best adapted. In so doing, they become more vulnerable to human exploitation. When jackrabbit populations crash, lynx die of starvation if unable to backtrack to suitable habitats. This hypothesis parallels lynx movements during and following snowshoe hare population crashes in boreal habitats in Alaska and Canada. The 3 lynx harvested in the Magic Valley in the late 60s and early 70s are examples of animals that appear to fit this hypothesis. The condition of these lynx, however, suggests that they are capable of traveling great distances across and effectively using shrub-steppe habitats.

H2. Lynx follow jackrabbit population highs many miles from habitats that they are best suited and end up near other similar habitats. This could explain disjunct populations of lynx.

H3. Lynx exploit jackrabbit population highs without leaving traditional habitats. In some areas, as jackrabbit densities peak, individual hares disperse into habitats where they normally would not occur, or in the case of white-tailed jackrabbits, where they do normally reside.

H4. Lynx move into shrub-steppe habitats, where they exist until jackrabbit populations crash, and then disperse back into forested habitats from which they came.

H5. In the southern portions of their range, dispersing lynx often follow riparian corridors within shrub-steppe habitats when forested habitats are not continuous or contiguous.

H6. Lynx make nocturnal forays into areas experiencing jackrabbit population highs, but continue to use traditional habitats for security and cover.

Although all of these proposed hypotheses probably occur, it is likely that the last 4 occur with the greatest frequency and could contribute to lynx densities not explained by static low-level snowshoe hare populations. Anecdotal evidence also suggests there is a disproportionate use of riparian areas for travel, dispersal, and security when lynx access areas of jackrabbit population highs.

This information suggests that there may be 3 factors that lead to population recruitment and the persistence of lynx in the conterminous United States: (1) the emigration of lynx from Canada, especially following population peaks; (2) early successional habitats created by large-scale wildfires; and (3) availability of jackrabbits as prey species in shrub-steppe habitats adjacent to limited boreal habitat and/or between noncontiguous areas of traditional lynx habitats.

It has been hypothesized that the population changes of black-tailed jackrabbits over large areas may constitute the collective changes of numerous subpopulations on smaller areas (Gross et al. 1974). It has been further hypothesized that a chance localized weather effect or concentration of predator activity, or their absence result in differing patterns of population change (Gross et al. 1974). There, however, was sufficient similarity over this broad region to stamp the late 1960's or early 1970's, the early 80's and the early 90's as the high-density years (Stoddart 1987, Knowlton and Stoddart 1992, U.S. Dep. Interior 1996). The variation in synchrony between localized areas is a characteristic also reported for snowshoe hare (Keith 1963, Dodds 1965). INSERT FIGURES HERE

Anecdotal information and research indicates that the total area experiencing jackrabbit population explosions and peak densities has declined every cycle since the late 60's and early 70's (U.S. Dep. Interior 1996). There are 3 factors that appear to contribute to jackrabbit population declines. The first is large-scale fragmentation of shrub-steppe habitats by urbanization, agricultural lands, and habitats changing from shrub to grasslands. Conversion of shrubs to grasslands is likely having the most profound effect because it involves millions of acres. In the Snake River Birds of Prey National Conservation Area, studies resulted in the conclusion that successive declines in jackrabbit densities through 3 population peaks may be the result of increased cover of grasslands in the NCA from the 1970s until present (U.S. Dep. Interior 1996). The second factor likely contributing to jackrabbit population declines is livestock grazing. Studies have found blacktail jackrabbit dietary overlap of 51% with cows and 56% with sheep (Johnson 1979). Livestock grazing may reduce forage availability to the point that it limits leporid population density (MacCracken and Hansen 1984). On the Idaho National Engineering Laboratory leporids were most abundant in ungrazed sites (MacCracken and Hansen 1984). The third factor that may limit jackrabbits is predation. Long-term studies in northern Utah and southern Idaho suggest that predation, primarily by coyotes, may be an important factor in the cyclical nature of these populations (Clark 1972, Knowlton and Stoddart 1992).

Outdoor Recreation and Recreational Vehicles

Off highway vehicle impacts have been identified as a potential threat to lynx. Off highway vehicles, or OHVs, are defined as vehicles capable of travel on or immediately over land, water, or other natural terrain, deriving motive power from any source other than muscle (Bureau of Land Management 1996). For the purposes of this discussion the term OHV includes snowmobiles, all-terrain vehicles (ATVs), motorcycles and four-wheel drive vehicles.

OHV impacts are seldom described in lynx research. Koehler and Aubry (1994) believe that winter snowmobile trails increase foraging competition from other predators such as bobcat and coyote. Due to the packing effect, snowmobile use opens routes in deep snow areas that are otherwise inaccessible to lower elevation predators. Additionally, increased OHV activity generates more human/lynx encounters that may result in increased lynx mortality from intentional and unintentional shooting and collisions with vehicles (Koehler and Brittell 1990).

There is no data available on the physiological and behavioral response of lynx to OHVs. A review of literature on the effects of OHVs on wildlife in general may be helpful in extrapolating those impacts to lynx. Numerous research projects have documented the effects of human encounters on other wildlife species (Bowles, 1995, Gutzwiller 1995, Gabrielson and Smith, 1995, Knight and Cole, 1995). Gabrielson and Smith (1995) conducted telemetry studies on a variety of wildlife species, and a literature review of wildlife response to human disturbance.

According to Gabrielson and Smith (1995), human disturbance of wildlife results in changes to the animal's normal physiological condition and behavior. They conclude that wildlife utilize 2 fundamental strategies when disturbed by humans; the "fight and flight" response or the "freezing/playing dead" response. Gabrielson and Smith (1995) note that the physiological capacity for both options is available, but is used differently by individual species.

The physiological changes associated with the "fight and flight" response include elevated activity, elevated heart rate, elevated metabolism, increased body temperature, increased respiration rate and depth, increased oxygen consumption, and elevated skeletal, brain and heart blood flow. Physiological changes reverse when an animal responds by "freezing/playing dead", with decreased activity, decreased heart rate, decreased metabolism, decreased body temperature, decreased respiration rate and depth, decreased oxygen consumption, and decreased skeletal, brain, and heart blood flow (Gabrielson and Smith 1995).

Wildlife behavioral changes following human disturbance have been documented for many species. These include abandonment of den sites and/or young, change in foraging locations, expansion of home ranges, and temporary or long term displacement (Gabrielson and Smith 1995, Bowles 1995).

The magnitude of wildlife response to humans seems to depend on the distance, the movement pattern of the human, and the animal's access to cover. Gabrielson and Smith (1995) note that most animals seem to tolerate disturbance better in woodland than in open terrain, and seem to be less responsive to humans following a distinct, predictable path through an area. Some species display an ability to habituate to human presence, such as the sound of engines passing through an area (Bowles 1995).

Given responses to disturbance exhibited by other species, it can be speculated that human encounters cause physiological and behavioral change in lynx. It is probably safe to speculate that lynx employ the “fight and flight” response to human disturbance. However, the extent to which this affects lynx displacement or mortality is unknown. The degree of disturbance to lynx is not known for variables such as human group size, behavior, method of transport, length of time spent in the vicinity, and frequency of encounters. The ability of lynx to habituate to OHV noise and human encounters is not known.

Outdoor Recreation Demand

The public demand for outdoor recreation activities has been growing in the United States since after World War II, and there is no decline in sight (Flather and Cordell 1995). Demographic changes in the U.S. population and advances in recreation equipment technology have resulted in this increased demand.

While public demand for outdoor recreation opportunities has increased, the availability of places for outdoor recreation has decreased. About 60% of the United States' potential land and water base are under private ownership with restricted access (Cordell et al. 1990). In 1987, only 23% of rural private lands were open to the public without restriction, a decline of nearly 30 million hectares since 1977 (Cordell et al. 1990). There is a trend toward greater closure and exclusive leasing of private land (Cordell et al. 1993). Given the trends toward increasing public demands for outdoor recreation opportunities, and decreasing or limited availability of places, federal and state owned lands will likely continue to receive increasing pressure from recreationists.

The most recent Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan (SCORTP 1997) provides a contemporary assessment of outdoor recreation and tourism in Idaho. According to the SCORTP (1997), tourism has evolved from a position of obscurity to the fastest growing social and economic activity in Idaho. The SCORTP (1997) predicts that increasing numbers of people will discover Idaho as a desirable place to visit and live.

Idaho's Outdoor Recreation Providers

The Idaho Rural Tourism Development Strategy developed in the mid-1990s by The Idaho Department of Commerce focuses on using tourism as a tool to diversify economics and create jobs in rural Idaho. Identified in the strategy was the need for more trails near urban areas and in rural areas, and more adequate snowmobile parking areas and snowmobile trail grooming (SCORTP 1997).

The Idaho Department of Parks and Recreation (IDPR) operates an extensive motorized and non-motorized trails program. The IDPR has purchased 32 groomers for snowmobile and cross-country ski trails. The groomers are loaned to counties depending on user registration fee allocations and user demands. The IDPR works with user groups and land management agencies to provide for recreation trail planning, development and maintenance.

Idaho State Licensed Outfitters and Guides have been offering outdoor recreation experiences for more than 100 years (Lansche 1987). In response to growing demand for more diverse experiences, outfitters and guides now offer cross-country and backcountry alpine skiing and snowmobiling. Current snowmobile client use figures are not available, however there has been an 11% increase in the number of outfitters and guides offering snowmobile trips since 1988 (IOGB unpublished data).

The 2 largest land managing agencies in Idaho are the U.S. Forest Service and the Bureau of Land Management. Together they administer 32,296,773 acres, or about 61% of Idaho's total land base (SCORTP 1997). A 1994-95 inventory of outdoor recreation facilities in Idaho revealed that trails and trailheads are provided almost exclusively by the Forest Service (SCORTP 1997, Cook, pers. commun.). Interviews with field agency staff in Idaho indicate that demands for OHV opportunities are increasing and in some areas, exceeding the supply (Moe, Smith, Sulker, Miczulski pers. commun.).

In 1991, there were 5,848 miles of designated snowmobile trails and 7,020 miles of ATV trails (SCORTP 1997). The 1993 IDPR State Trails Plan found that more trails are needed to disperse use and reduce user conflicts, and that snowmobile parking areas and snowmobile trail grooming are inadequate in the state (SCORTP 1997). As of 1994, snowmobile trail miles totaled 7,200, the increase resulting from better reporting and from adding grooming programs in Cassia and Clearwater counties (Cook, pers. comm.).

Off Highway Vehicle Trends

Snowmobiles

The first snowmobiles appeared on the market in the 1950's. Ten years later, there were dozens of manufacturers. According to the International Snowmobile Manufacturers Association (ISMA), United States snowmobile sales reached an all time high in 1971, with 342,000 units sold. The economic recession and fuel shortages of the 1980's resulted in plummeting snowmobile sales, with unit sales dropping to 49,000 in 1983. Since 1991, snowmobile sales have increased annually. In 1997, 170,325 new snowmobiles were purchased (ISMA 1997).

Idaho law requires that all OHVs operated in Idaho be registered. The number of registrations in each county helps determine the availability of off road vehicle funds for county projects. According to IDPR records, in 1973, there were 17,782 registered snowmobiles in Idaho. Registrations experienced declines in the late 1970's and early 1980's, with a rebound to 20,307 registrations in 1988. In 1992, registrations increased to 27,509. Over the past 3 seasons, Idaho's snowmobile registrations have increased more than 10% per year (Idaho Outside 1996). Snowmobile registrations in 1997 are at an all time high of 34,768 (IDPR unpublished data 1997).

Each snowmobile registration form allows the owner to designate the registration fees to go to 1 county of choice. The top 10 counties where 1996 registrants designated fees are as follows (IDPR unpublished data 1997): Fremont 4,080; Valley 3,851; Bonneville 2,533; Kootenai 2,406; Bonner 1,720; Boise 1,537; Bannock 1,139; Twin Falls 997; Elmore 951; Ada 318.

Snowmobilers in the United States spend over $4 billion on their sport each year (ISMA 1997). A study concluded that snowmobiling is responsible for $189.5 million in economic impact in the state of Wyoming (ISMA 1997). A similar economic study has not been conducted in Idaho, but Idaho's snowmobile program is more extensive than Wyoming's (Frost pers. comm).

Snow machines of the 1970s were primitive relative to today's standards. It was rare for snowmobilers to take day trips more than 100 miles, and machines were not capable of reaching high elevation backcountry areas (SnowGoer Magazine 1997). Today's machines have incorporated better suspension, increased power, better ride quality, improved comfort for all-day rides, and larger, deeper tracks (SnowGoer Magazine 1997, Frost pers. comm.). Today's machines allow beginning riders to access backcountry areas that were formerly reserved for expert riders or inaccessible. The average snowmobiler rides their snowmobile 1,520 miles per year (ISMA 1997). It is not uncommon for a modern snowmobiler to take day trips of more than 200 miles (SnowGoer Magazine 1997). According to ISMA, customers can expect continued improvements in the dependability, reliability and quality of future snowmobiles. Advertisements for next year's models tout machines that will "change the face of snowmobiling" (SnowGoer Magazine 1997).

Western state snowmobile opportunities are highly desirable for the high elevation, scenic mountainous country; hill climbing opportunities; off-trail opportunities; and deep powder snow conditions (Frost, Miczulski, Smith, Sulker, SnowGoer Magazine 1997). Idaho is additionally known for its well-developed trails system (Cook pers. comm.). Many groomed snowmobile trails follow routes that are existing roads and trails in the summer. Some trails provide access to upper elevations, where snowmobilers can travel cross-country for miles and "play" in the deep powder bowls. (Smith, Miczulski pers. comm.). For many areas, use is dictated by a "go where your technology and skills will take you" sentiment (Smith, Liner, Miczulski, Richie pers. comm.) As the popularity of backcountry snowboarding and telemarking increases, a number of backcountry enthusiasts are now using snowmobiles to access desirable high elevation slopes (Watters 1998).

Snowmobile areas in Idaho are displayed on the "Ride the Endless Trails of Idaho" map and guide to snowmobiling (IDPR date unknown). This map and guide has not been recently updated and is not all-inclusive, but does provide a fairly accurate depiction of snowmobile use areas in the state (Cook pers. comm.). INSERT SNOWMOBILE USE AREA MAP HERE.

A few federal agency administrative units in Idaho have data relative to snowmobile use. The Targhee National Forest in southeastern Idaho has documented dramatic snowmobile use increases in recent years. Yellowstone National Park, known as the "snowmobiling capital of the United States", has recently implemented rules and restrictions on snowmobile use in the park. Subsequently, many snowmobilers are seeking adjacent areas for similar scenery and terrain and fewer use restrictions (Sulker pers. comm.). The Targhee National Forest offers more than 600 miles of groomed and maintained trails, and challenging backcountry areas in the Centennial Mountains, Mount Jefferson, along the Continental Divide, and south of the Moneida pass. (Sulker pers. comm.).

The Sawtooth National Forest has documented small use increases in recent years. The Stanley area has about 200 miles of groomed trails that allow riders to travel through the Boise Mountains to Lowman, Featherville, Idaho City, and even Boise on a good snow year (SnowGoer Magazine 1997). The Fairfield area is growing in popularity with snowmobilers (Miczulski pers. comm.). Most use is concentrated in the Soldier Mountains, with some riders venturing as far as Smiley Creek from the Fairfield side (Miczsulski pers. comm.).

Snowmobiling use has increased to the point of saturation on the Caribou National Forest (Smith pers. comm.). The area offers more than 200 miles of groomed trails. Many users from Utah have discovered the Wasatch and Bear River Ranges and the extensive off trail basin and bowl riding opportunities. Parking areas are often overcrowded.

The Idaho Panhandle National Forests support hundreds of miles of groomed snowmobile trails and off-trail opportunities. Plentiful routes are available throughout the Bitteroot Range, the Couer d'Alene Mountains, the St. Joe Mountains, and the Clearwater Mountains. Silver County has recently been touted as the "new snowmobile/ATV capital of the United States", offering a 1,000 mile system of groomed and ungroomed trails for snowmobiles in the winter and ATVs in the summer (Richie pers. comm.). Subsequently, this area has experienced increased OHV use year-round (Richie per. comm.).

A 1994-1995 survey of Idaho snowmobilers revealed that snowmobilers want groomed, well marked trails with additional off-trail riding opportunities. Other desired characteristics include riding opportunities with easy access, mountain views, and a "mix" of trees and open space. Parking areas, maps, restrooms and warming huts are priority amenities. Eighty-four percent of snowmobilers agree that more lands in Idaho need to be opened to snowmobile use. Snowmobilers want more new, larger parking areas near trail heads, more new groomed trails, more backcountry trail opportunities and more developed trail systems (Idaho Forest, Wildlife and Range Experiment Station 1996).

All Terrain Vehicles

According to the Motorcycle Industry Council, 1997 is the sixth consecutive year for growth in motorbike and ATV sales. Forty-seven percent of new unit sales are ATVs and 53% motorbikes (Motorcycle Industry Council pers. comm.).

According to the IDPR, ATV registrations have recently ballooned in Idaho. In 1995, there were 11,327 registered ATVs. In 1996, this increased to 14,735. This increase is partially due to greater compliance with the registration system, and partially due to the growing popularity of ATVs (Frost pers. comm.).

Similar to snowmobiles, technological advances have been made in ATV design. Today's riders can access more terrain due to better suspension, improved clearance, and increased power (ATV Magazine 1997).

Idaho has very few trails specifically designed for ATV use. Most ATV trails have been created by use and not by management design (SCORTP 1997, Smith, Moe, Frost pers. comm.). ATV use has been observed to be increasing statewide (Frost pers. comm.). The IDPR supports creation of more ATV trails, perhaps by converting existing logging roads into loop trail systems (Frost, Cook pers. comm.). Most ATV users in Idaho want long trails with abundant scenery and few people (SCORTP 1997). ATV users also want more new trails; more access to the backcountry, and access to areas that are currently closed.

OHV Use Figures and Projections

Based on an analysis of the 1985 to 1987 Public Area Recreation Visitor's Survey, and other use surveys on national forests in the United States, the United State Forest Service predicted that snowmobiling and off-road driving would grow at respective rates of 31% and 8%, relative to their 1987 levels, by the year 2010 (Flather and Cordell 1995). Although ATV use figures are not available, snowmobile use trends in Idaho national forests show steady increases (Table 3).

Table 3 . Snowmobile Use on Idaho National Forests

	1989 RVDs* (thousands)	1992 RVDs* (thousands)	1996 RVDs* (thousands)
Region I	112.7	119.4	192.1
Region IV	265.0	237.8	434.1
Regions I and IV	377.7	357.2	626.2

RVD = Recreaton Visitor Day (12 hours). USFS, Recreation Information Management System, 1997.

Idaho Wilderness

Idaho has more wilderness area than any other of the lower 48 states. Idaho's 2,364,541 acre Frank Church-River of No Return Wilderness is the nation's largest roadless area and the nation's largest designated Wilderness Area outside of Alaska. A single dirt and gravel road, the MacGruder Corridor, separates the Frank Church from the Selway-Bitterroot Wilderness, 1,089,017 acres of which is in Idaho and 251,443 in Montana. Idaho has a total of 3,960,221 acres of designated wilderness (Table 4).

Table 4. Idaho Wilderness Areas (Wilderness Report to Congress, 1990).

Wilderness Area Name	Administrative Unit	Wilderness Acres
Craters of the Moon	Craters of the Moon NPS	43,243
Frank Church River of No Return	Bitterroot NF	193,703
	Boise NF	331,611
	Challis NF	515,421
	Nez Perce NF	110,698
	Payette NF	791,675
	Salmon NF	421,433
	Coeur d'Alene BLM	720
Gospel Hump	Nez Perce NF	205,764
Hells Canyon	Nez Perce NF	59,900
	Payette NF	23,911
Sawtooth	Boise NF	150,071
	Challis NF	12,020
	Sawtooth NF	54,997
Selway-Bitterroot	Bitterroot NF	270,321
	Clearwater NF	259,165
	Nez Perce NF	559,531

Conclusions

Many factors are apparently involved in assessing the potential threat to lynx from OHVs in Idaho. There is no question that the numbers of individuals participating in OHV use has increased, and all indications are that OHV use will continue to increase and place increasing demands on federal and state lands (Smith, Moe, Sulker, Miczulski, Liner, Richie, Frost, Cook pers. comm., Cordell et. al. 1993). Manufacturers have progressively made improvements to OHVs, providing greater comfort, stability, and performance, and enabling riders to access terrain that was formerly inaccessible to motorized vehicles. WILDERNESS MAP AND LYNX DISTRIBUTION OVERLAY.

Lynx likely have behavioral and physiological responses from OHV encounters similar to those that have been demonstrated for other wildlife species. Of particular concern for lynx conservation is the high degree of overlap between the areas experiencing the most OHV use and those areas where lynx have been consistently found and seem to prefer. Additionally, wilderness areas are not necessarily the areas where lynx have been regularly documented. Non-wilderness areas in the Panhandle, Targhee, and Caribou National Forests are all examples. Although research is needed to assess the degree of OHV impact to lynx, the many variables such as type of use, time of year, group size and behavior, frequency of encounters, habitat type, and numbers of lynx inhabiting these areas makes the costs associated with such studies almost prohibitive and the conclusions drawn from them difficult to interpret and apply to other areas operating under a different set of variables and their interactions.

Regional Outlook

Conclusion

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Appendices

Appendix A

Records of Canada Lynx in Idaho by Date

Date	County	Location	Detail	IDFG Region	C/P*	Reference
?	Bonner	Priest Lake	Tracks	Panhandle	P	Lee Carrick
?	Shoshone	S of Avery/Avery Timber Creek Rd	Tracks	Panhandle	P	Dick Anderson
?	Shoshone	SW of Avery/Marble Creek	Tracks	Panhandle	P	Dick Anderson
?	Shoshone	SW of Avery/Marble Creek	Tracks	Panhandle	P	Harold Wadley
?	Lemhi	N of North Fork/Hughes Creek	Chased	Salmon	P	Don McPherson
1901	Shoshone	SW of Avery/Marble Creek	Trapped	Panhandle	C	No name*
1919	Boundary	NW of Bonners Ferry/btw Trout & Ball Crs.	Trapped 1	Panhandle	C	David Routch*
1936	Idaho	Indian Graves Creek/Graves Butte	Trapped 1	Clearwater?	C	No name*
1942	Clearwater	Near Pierce	Trapped 1	Clearwater	C	Phil Dolerath*
1947 or 48	Caribou	NE of Soda Springs/Trail Canyon	Trapped 5	Southeast	C	Oliver Peterson
1950-60	Bear Lake	E of Georgetown/Georgetown Creek	Trapped 1	Southeast	C	Oliver Peterson
1950-60	Bear Lake	East of Georgetown/Snowdrift Mtn.	Trapped 1	Southeast	C	Oliver Peterson
1950-60	Caribou	NE of Soda Springs/Trail Canyon	Trapped 1	Southeast	C	Oliver Peterson
1950-60	Caribou	E of Soda Springs/Diamond Creek	Trapped 1	Southeast	C	Oliver Peterson
1950s	Lemhi	SW of Tendoy/McDevitt Creek	Harvest w/dogs	Salmon	C	Laverne Hokanson
1950s	Lemhi	SW of Shoup/Clear Cr. off Panther Cr.	Trapped 2	Salmon	C	Larry Maxwell
1952	Lemhi	Lemhi River, mouth of Baldy Creek	Trapped 1	Salmon	C	R. J. Smith
1954/55wntr	Caribou	E of Wayan/Tincup & Stump Creeks	Trapped 2	Southeast	C	Roy Keener*
1959-67	Blaine	Alturas Lake Creek	Harvest w/dogs	Salmon	C	Harold Wadley
1959-67	Boise/Custer	W of Redfish Lake/Observation Peak	Harvest w/dogs	Southwest	C	Harold Wadley
1959-67	Boise/Custer	Breaks of Grand Jean to Cape Horn Mw	Observation	Salmon	P	Harold Wadley

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1959-67	Custer	White Clouds south of Clayton	Observation	Salmon	P	Harold Wadley
1959-67	Custer	East Fork of the Salmon River	Observation	Salmon	P	Harold Wadley
1959-67	Custer	W of Redfish Lake	Harvest w/dogs	Salmon	C	Harold Wadley
1959-67	Custer	W of Stanley/Iron Creek	Harvest w/dogs	Salmon	C	Harold Wadley
1959-67	Custer	W of Stanley/Stanley Creek	Harvest w/dogs	Salmon	C	Harold Wadley
1959-67	Custer	NW of Clayton/Squaw Creek	Observation	Salmon	P	Harold Wadley
1959-67	Custer	E of Yankee Fork/Basin Creek	Observation	Salmon	P	Harold Wadley
1959-67	Custer	W of Stanley/Iron Creek	Den w/kittens	Salmon	P	Harold Wadley
1960's mid	Oneida	Near Malad City	Trapped 1	Southeast	C	Kirk Eberhard
1960-70	Caribou	Soda Springs/Combine Hill	Tracks	Southeast	P	Oliver Peterson
1960-80	Idaho	Horse Heaven Cabin at Kim Saddle	Tracks	Clearwater	P	Don McPherson
1960s	Kootenai	Spruce Ridge/N.Fork Couer d'Alene R.	Observation	Panhandle	P	Lester Gesel
1960s	Lemhi	Squaretop Mtn.	Tracks	Salmon	P	Laverne Hokanson
1961-64	Teton	W of Victor/Patterson Creek	Trapped 1	Upper Snake	C	Bill Scheiss
1962 Dec.	Bonner	W of Priest Lake/Packer Meadows	Trapped 1	Panhandle	C	William Schleiper
1964	Idaho	Falls Creek	Trapped 1	Clearwater?	C	No name*
1964 & prior	Boundary	N of Bonners Ferry/Queen Mtn. Rd.	Trapped 4	Panhandle	C	Bob Campbell
1964 & prior	Boundary	N of Bonners Ferry/Queen Mtn. Rd.	Treed w/dogs 2	Panhandle	C	Bob Campbell
1964 Nov.	Clearwater	W of Headquarters/Kelly Cr./Gorman Hill	Trapped 1	Clearwater	C	Charles Hall
1965 Nov.	Clearwater	W of Headquarters/Kelly Cr./Gorman Hill	Trapped 1	Clearwater	C	Charles Hall
1966	Custer	Crossed Hwy 75 at Redfish turnoff	Observation	Salmon	P	R. J. Smith
1966-11-23	Adams/Valley	NW of McCall/Brundage Mtn.	Harvested 1	Southwest/north half		No name
1967	Bonner	E of Lake Pend Oreille/Spruce Mtn.	Trap/release	Panhandle	C	Leo Black[d]
1967-68wntr	Clearwater	N Fork Clearwater River/Weitas Creek	Observation	Clearwater	P	Don Jenni
1968	Fremont	Island Park Res./Icehouse Creek	Shot 1	Upper Snake	C	Paul Valcarce
1968 (~)	Jerome	Eden	Shot 1	Magic Valley		No name

1968-69wntr	Clearwater	N Fork Clearwater River/Weitas Creek	Observation	Clearwater	P	Don Jenni
1970-92	Fremont	Btw Island Park Res. & Henrys Lake	Tracks	Upper Snake	P	John Stevens
1970s	Custer	S of Mackay/Trail Creek	Ran w/dogs	Upper Snake	P	Laverne Hokanson
1970s	Lemhi	SW of Gilmore	Ran w/dogs	Salmon	P	Laverne Hokanson
1970s	Lemhi	Leadore/Tobias Creek	Ran w/dogs	Salmon	P	Laverne Hokanson
1970s	Lemhi	S of Leadore/Texas Creek	Trapped 1	Salmon	C	Bedford Stroud
1970s	Lemhi	E of Leadore/Hawley Creek	Trapped 1	Salmon	C	Bedford Stroud
1970s	Lemhi	Lemhi River NW of Leadore	Trapped 1	Salmon	C	Bedford Stroud
1970s	Lemhi	SW of Lemhi/Hayden Creek	Shot 1	Salmon	C	Tobias[b]
1970s	Lemhi	S of Gibbonsville/Lick Creek	Observation	Salmon	P	Dave Williams
1970s	Lemhi	E of Tendoy/Agency Creek	Tracks	Salmon	P	Dave Williams
1970s	Lemhi	NE of Tendoy/Pattee Creek	Tracks	Salmon	P	Dave Williams
1970s early	Custer	Near Mackay	Shot 1	Upper Snake	C	Larry Jarrett[b]
1970s early	Jerome/Twin	1 mile W of Milner Dam	Observation	Magic Valley	P	J. R. Scholls
1970s late	Lemhi	W of Leadore/Mill Creek	Harvest w/dogs	Salmon	C	Laverne Hokanson
1970s late	Lemhi	E of Tendoy/Cow Creek	Observation	Salmon	P	R. (Doc) Smith
1970s late	Lemhi	N of Tendoy/Kenney Creek	Tracks	Salmon	P	R. (Doc) Smith
1970s mid	Fremont	Henrys Lake Flat	Trapped 1	Upper Snake	C	Vard Wright
1970s mid	Lemhi	W of Salmon/Leesburg Basin	Harvest w/dogs	Salmon	C	Ray Torrey[a]
1971 or 72	Valley	E Deadwood Res./Bear Valley/Sock Cr.	Trapped 1	Southwest/north half	C	Roger Jackson
1972	Twin Falls	5 miles south of Hansen	Shot 1	Magic Valley	C	Ken Daws
1972	Blaine	Near Bellevue	Roadkill	Magic Valley	P	Mrs. Bud Batchelder
1972	Blaine	Near Carey	Roadkill	Magic Valley	P	Gary Will
1972	Bear Lake	W of Nounan/Skinner Canyon	Trapped 1	Southwest	C	Jim Burghome
1972	Fremont	Henrys Fork of the Snake River	Shot 1	Upper Snake	C	Tony Latham
1972	Idaho	Highway 12 at No See Um Creek	Roadkill	Clearwater	C	Don McPherson

1972	Butte	Arco area	Shot 1	Upper Snake	C	George Yerby*
1972-12-27	Jerome	E of Jerome/between Eden & Hazelton	Shot 1	Magic Valley	C	Pete Fabela
1973	Bear Lake	N of Georgetown/Rattlesnake Canyon	Trapped 1	Southeast	C	Johnny Hottle
1976	Lemhi	E of Salmon/Geertson Creek	Harvest w/dogs	Salmon	C	Jerry Meyers
1976	Lemhi	SW of Leadore/Swan Basin	Ran w/dogs	Salmon	P	R. (Doc) Smith
1976-77	Custer	NW of Stanley/Knapp Creek road	Observation	Salmon	P	Ray Lyon
1976-78	Blaine	S of Alturas Lake/Beaver Cr./Smiley Cr.	Tracks	Salmon	P	Skip Schaeffer
1977-82	Shoshone	SW of Avery/Marble Creek	?	Panhandle	P	Joe Blackburn
1978	Clearwater	W of Headquarters/cnf Kelly & Pileup Crs.	Trapped 1	Clearwater	C	Don Jenni*
1978	Shoshone	SW of Avery/Marble Creek	Trapped 3	Panhandle	C	Cecil Sanford*[c]
1978 or 79	Caribou	E of Wayan/Tincup Creek	Trapped 1	Southeast	C	Troy Weeks
1978-01-20	Kootenai	Couer d'Alene River/Lost Creek	Shot 1	Panhandle	C	Larry Irwin*
1978-01-27	Valley	NE of Cascade/Near Warm Lake	Trapped 1	Southwest/north half	C	George Hawkins*
1979-01-08	Fremont	Near Henrys Lake	Trap 4/release 1	Upper Snake	C	John Stevens*
1980s	Fremont	Shotgun Valley/Island Park Res.	Trapped 1	Upper Snake	C	Kirk Buehler
1980s early	Lemhi	W of Leadore/Mill Creek	Trapped 1	Salmon	C	Bedford Stroud
1980s mid	Custer	W of Challis/Mosquito Flat	Observation	Salmon	P	Ron Malone
1980s mid	Lemhi	W of North Fork/Spring Creek	Tracks	Salmon	P	Larry Maxwell
1980s mid	Lemhi	W of North Fork/Squaw Creek	Observation	Salmon	P	Ron Malone
1982-01-21	Nez Perce	Near Kendrick	Shot 1	Clearwater	C	Rich Arnett
1982-83wntr	Clark	W of Dubois/Medicine Lodge Creek	Observation	Upper Snake	P	Brian Aber
1982-87	Fremont	N of Ashton/Big Bend Ridge	Trapped 1	Upper Snake	C	Bruce Pentski*
1983	Fremont	Reynolds Pass	Trapped 1	Upper Snake	C	No name*
1983 July	Lemhi	NW of North Fork/Pine Creek	Observation	Salmon	P	Dick Wenger
1983-01-21	Clearwater	Lochsa River	Trapped 1	Clearwater?	C	No name*
1983-12-17	Lemhi	SW of Salmon/Williams Creek	Trapped 1	Salmon	C	No name*

1984-12-21	Shoshone	Falls Creek (mgmt unit 6)	Trapped 1	Panhandle?	C	No name*
1985	Custer	NW of Stanley/Knapp-Beaver Cr.	Tracks	Salmon	P	Tim Kemry
1986	Fremont	W of Ashton	Trapped 3	Upper Snake	C	John Stevens
1986 Nov.	Lemhi	Big Hole Pass	Tracks	Salmon	P	Dick Wenger
1987	Idaho	Sheep Creek/7-8miles from Shep Ranch	Tracks	Clearwater	P	Ron Sherer
1987	Idaho	NE of Moose Creek R.S./Moose Creek	Trapped 1	Clearwater	C	Larry Maxwell
1987	Idaho	E of Grangeville/btw Peasley & Green	Tracks	Clearwater	P	Ron Sherer
1987	Shoshone	SW of Avery/Marble Creek	Harvested	Panhandle	C	Charlie Harpole[e]
1987	Custer	S of Stanley/Fourth of July Creek	Trapped	Salmon	C	Craig Rember
1987	Custer	W of Stanley/Stanley Lake	Trapped	Salmon	C	Craig Rember
1987	Custer	W of Stanley/Marsh Creek	Trapped	Salmon	C	Craig Rember
1987	Custer	S of Stanley/Alturas Lake	Trapped	Salmon	C	Craig Rember
1989	Fremont	NE of Ashton/headwaters Warm River	Tracks	Upper Snake	P	Bill Scheiss
1989 or 90	Clark	N of Kilgore/head of Coal Mine Drainage	Tracks	Upper Snake	P	Brian Aber
1989 or 90	Blaine	NW of Ketchum/Emma Creek	Tracks	Salmon	P	Ken Higgs
1989-12-07	Boundary	W of Priest Lake/Zero Creek	Trapped 1	Panhandle	C	Delbert Jepson*
1990	Power	SW of Rockland/Dairy Creek	Trap/release 1	Southeast	C	Animal Damage Control
1990	Lemhi	W of North Fork/Spring Creek	Tracks	Salmon	P	Larry Maxwell
1991 Nov	Clearwater	N Fork Clearwater River/Lake Creek	Observed 3 kittens	Clearwater	P	Don Jenni
1991-07-01	Latah	USFS Rd. 3820, Palouse Ranger Dist.	Found Dead	Clearwater	C	Conservation Data Center
1991-12-07	Idaho	S Fork Clearwater/Earthquake Basin	Shot 1	Clearwater	C	Greg Gulick*
1991-12-26	Lemhi	SW of Leadore/Big Creek	Trapped 1	Salmon	C	Raymond Whittier*
1991-92	Teton	W of Victor/Patterson Creek	Tracks	Upper Snake	P	Bill Scheiss
1992	Bonner	W of Priest Lake/Granite Pass	Tracks	Panhandle	P	Donny Endicot
1992	Bonner	W of Priest Lake/Boulder Mtn.	Tracks	Panhandle	P	Joe Avery
1992-93	Teton	NE of Felt/Tepee Creek	Tracks	Upper Snake	P	Bill Scheiss

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1993	Lemhi	Lake Creek/Williams Lake	Tracks	Salmon	P	Laverne Hokanson
1994 winter	Bonner	W of Priest Lake/Granite Pass	Tracks	Panhandle	P	Donny Endicot
1994-97	Elmore	Falls Creek/near Anderson Ranch Res.	Observation	Magic Valley	P	Trevor Hill
1995	Custer	S of Stanley/Fourth of July Creek	Tracks	Salmon	P	Craig Rember
1995	Bonner	W of Priest Lake/Granite Creek at Zero Creek	Tracks	Panhandle	P	Delbert Jepson
1995	Bonner	?/Trapper Creek	Tracks	Panhandle	P	Delbert Jepson
1995 Jan.	Lemhi	S of Cobalt/Panther Creek	Tracks	Salmon	P	Dick Wenger
1995-96	Lemhi	Big Hole Pass	Tracks	Salmon	P	Larry Maxwell
1995-96wntr	Idaho	Tom Beal Park/N of Grave Peak	Tracks	Clearwater	P	Joe Avery
1996	Bonner	S of Priest Lake/Middle Fork of E. River	Observation	Panhandle	P	Delbert Jepson
1996 Nov.	Custer	Near Seafoam R.S./Rapid River	Tracks	Salmon	P	Tim Kemry
1996 Nov.	Elmore	W side Swanholm Peak/Swanholm Cr.	Tracks	Southwest/south half	P	Ron Sherer
1997 Feb.	Elmore	N NW side of Steel Mtn./Phifer Creek	Tracks	Southwest/south half	P	Ron Sherer
1997 Nov.	Clark	W of Island Park Res./Sheridan Creek	Tracks	Upper Snake	P	Brian Aber
1997 Oct.	Fremont	E of Henry's Lake/ridge N of Tygee Cr.	Tracks	Upper Snake	P	Brian Aber
1997 winter	Custer	Near Redfish Lake/Fishhook Creek	Tracks	Salmon	P	Ray Vizgirdas
1997-07-13	Idaho	W of McGruder Mtn./Selway-Bitteroot	Observation	Clearwater	P	Michael P. Murray

★Confirmed/Probable

*IDFG harvest records or historical records/checked by IDFG employee

[a] reported by Doc Smith

[b] reported by Andy Hagel, taxidermist

[c] reported by Kirk Eberhard

[d] reported by Lester Gesel, furrier

[e] reported by Lars Eidness, furrier

Appendix B

Records of Canada Lynx in Idaho by IDFG Region

Date	IDFG Region	County	Location	Detail	C/P*	Reference
1960-80	Clearwater	Idaho	Horse Heaven Cabin at Kim Saddle	Tracks	P	Don McPherson
1964 Nov.	Clearwater	Clearwater	W of Headquarters/Kelly Cr./Gorman Hill	Trapped 1	C	Charles Hall
1965 Nov.	Clearwater	Clearwater	W of Headquarters/Kelly Cr./Gorman Hill	Trapped 1	C	Charles Hall
1967-68wntr	Clearwater	Clearwater	N Fork Clearwater River/Weitas Creek	Observation	P	Don Jenni
1968-69wntr	Clearwater	Clearwater	N Fork Clearwater River/Weitas Creek	Observation	P	Don Jenni
1972	Clearwater	Idaho	Highway 12 at No See Um Creek	Roadkill	C	Don McPherson
1978	Clearwater	Clearwater	W of Headquarters/cnf Kelly & Pileup Crs.	Trapped 1	C	Don Jenni
1942	Clearwater	Clearwater	Near Pierce	Trapped 1	C	Phil Dolerath*
1982-01-21	Clearwater	Nez Perce	Near Kendrick	Shot 1	C	Rich Arnett
1987	Clearwater	Idaho	Sheep Creek/7-8miles from Shep Ranch	Tracks	P	Ron Sherer
1987	Clearwater	Idaho	NE of Moose Creek R.S./Moose Creek	Trapped 1	C	Larry Maxwell
1987	Clearwater	Idaho	E of Grangeville/btw Peasley & Green	Tracks	P	Ron Sherer
1991 Nov	Clearwater	Clearwater	N Fork Clearwater River/Lake Creek	Observed 3 kittens	P	Don Jenni
1991-07-01	Clearwater	Latah	USFS Rd. 3820, Palouse Ranger Dist.	Found Dead	C	Conservation Data Center
1991-12-07	Clearwater	Idaho	S Fork Clearwater/Earthquake Basin	Shot 1	C	Greg Gulick*
1995-96wntr	Clearwater	Idaho	Tom Beal Park/N of Grave Peak	Tracks	P	Joe Avery
1997-07-13	Clearwater	Idaho	W of McGruder Mtn./Selway-Bitteroot	Observation	P	Michael P. Murray
1936	Clearwater?	Idaho	Indian Graves Creek/Graves Butte	Trapped 1	C	No name*
1964	Clearwater?	Idaho	Falls Creek	Trapped 1	C	No name*
1983-01-21	Clearwater?	Clearwater	Lochsa River	Trapped 1	C	No name*
1968 (~)	Magic Valley	Jerome	Eden	Shot 1		No name

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1970s early	Magic Valley	Jerome/Twin	1 mile W of Milner Dam	Observation	P	J. R. Scholls
1972	Magic Valley	Twin Falls	5 miles south of Hansen	Shot 1	C	Ken Daws
1972	Magic Valley	Blaine	Near Bellevue	Roadkill	P	Mrs. Bud Batchelder
1972	Magic Valley	Blaine	Near Carey	Roadkill	P	Gary Will
1972-12-27	Magic Valley	Jerome	E of Jerome/between Eden & Hazelton	Shot 1	C	Pete Fabela
1994-97	Magic Valley	Elmore	Falls Creek/near Anderson Ranch Res.	Observation	P	Trevor Hill
1901	Panhandle	Shoshone	SW of Avery/Marble Creek	Trapped 1	C	No name*
?	Panhandle	Bonner	Priest Lake	Tracks	P	Lee Carrick
1960s	Panhandle	Kootenai	Spruce Ridge/N.Fork Couer d'Alene R.	Observation	P	Lester Gesel
?	Panhandle	Shoshone	S of Avery/Avery Timber Creek Rd	Tracks	P	Dick Anderson
?	Panhandle	Shoshone	SW of Avery/Marble Creek	Tracks	P	Dick Anderson
?	Panhandle	Shoshone	SW of Avery/Marble Creek	Tracks	P	Harold Wadley
1962 Dec.	Panhandle	Bonner	W of Priest Lake/Packer Meadows	Trapped 1	C	William Schleiper
1964 & prior	Panhandle	Boundary	N of Bonners Ferry/Queen Mtn. Rd.	Trapped 4	C	Bob Campbell
1964 & prior	Panhandle	Boundary	N of Bonners Ferry/Queen Mtn. Rd.	Treed w/dogs 2	C	Bob Campbell
1967	Panhandle	Bonner	E of Lake Pend Oreille/Spruce Mtn.	Trap/release	C	Leo Black[d]
1977-82	Panhandle	Shoshone	SW of Avery/Marble Creek	?		Joe Blackburn
1978	Panhandle	Shoshone	SW of Avery/Marble Creek	Trapped 3	C	Cecil Sanford*[c]
1978-01-20	Panhandle	Kootenai	Couer d'Alene River/Lost Creek	Shot 1	C	Larry Irwin*
1919	Panhandle	Boundary	NW of Bonners Ferry/btw Trout & Ball Crs.	Trapped 1	C	David Routch*
1987	Panhandle	Shoshone	SW of Avery/Marble Creek	Harvested	C	Charlie Harpole[e]
1989-12-07	Panhandle	Boundary	W of Priest Lake/Zero Creek	Trapped 1	C	Delbert Jepson*
1992	Panhandle	Bonner	W of Priest Lake/Granite Pass	Tracks	P	Donny Endicot
1992	Panhandle	Bonner	N end of Priest Lake/near Plowboy Mtn.	Tracks	P	Joe Avery
1994 winter	Panhandle	Bonner	W of Priest Lake/Granite Pass	Tracks	P	Donny Endicot
1995	Panhandle	Bonner	W of Priest Lake/Granite Creek at Zero Creek	Tracks	P	Delbert Jepson

1995	Panhandle	Bonner	?/Trapper Creek	Tracks	P	Delbert Jepson
1996	Panhandle	Bonner	S of Priest Lake/Middle Fork of E. River	Observation	P	Delbert Jepson
1964	Panhandle?	Shoshone	Falls Creek (mgmt unit 6)	Trapped 1	C	No name*
?	Salmon	Lemhi	N of North Fork/Hughes Creek	Chased	P	Don McPherson
1950s	Salmon	Lemhi	SW of Tendoy/McDevitt Creek	Harvest w/dogs	C	Laverne Hokanson
1950s	Salmon	Lemhi	SW of Shoup/Clear Cr. Off Panther Cr.	Trapped 2	C	Larry Maxwell
1952	Salmon	Lemhi	Lemhi River, mouth of Baldy Creek	Trapped 1	C	R. J. Smith
1959-67	Salmon	Blaine	Alturas Lake Creek	Harvest w/dogs	C	Harold Wadley
1959-67	Salmon	Boise/Custer	Breaks of Grand Jean to Cape Horn Mw	Observation	P	Harold Wadley
1959-67	Salmon	Custer	White Clouds south of Clayton	Observation	P	Harold Wadley
1959-67	Salmon	Custer	East Fork of the Salmon River	Observation	P	Harold Wadley
1959-67	Salmon	Custer	W of Redfish Lake	Harvest w/dogs	C	Harold Wadley
1959-67	Salmon	Custer	W of Stanley/Iron Creek	Harvest w/dogs	C	Harold Wadley
1959-67	Salmon	Custer	W of Stanley/Stanley Creek	Harvest w/dogs	C	Harold Wadley
1959-67	Salmon	Custer	NW of Clayton/Squaw Creek	Observation	P	Harold Wadley
1959-67	Salmon	Custer	E of Yankee Fork/Basin Creek	Observation	P	Harold Wadley
1959-67	Salmon	Custer	W of Stanley/Iron Creek	Den w/kittens	P	Harold Wadley
1960s	Salmon	Lemhi	Squaretop Mtn.	Tracks	P	Laverne Hokanson
1966	Salmon	Custer	Crossed Hwy 75 at Redfish turnoff	Observation	P	R. J. Smith
1970s	Salmon	Lemhi	SW of Gilmore	Ran w/dogs	P	Laverne Hokanson
1970s	Salmon	Lemhi	Leadore/Tobias Creek	Ran w/dogs	P	Laverne Hokanson
1970s	Salmon	Lemhi	S of Leadore/Texas Creek	Trapped 1	C	Bedford Stroud
1970s	Salmon	Lemhi	E of Leadore/Hawley Creek	Trapped 1	C	Bedford Stroud
1970s	Salmon	Lemhi	Lemhi River NW of Leadore	Trapped 1	C	Bedford Stroud
1970s	Salmon	Lemhi	SW of Lemhi/Hayden Creek	Shot 1	C	Tobias[b]
1970s	Salmon	Lemhi	S of Gibbonsville/Lick Creek	Observation	P	Dave Williams

ft

1970s	Salmon	Lemhi	E of Tendoy/Agency Creek	Tracks	P	Dave Williams
1970s	Salmon	Lemhi	NE of Tendoy/Pattee Creek	Tracks	P	Dave Williams
1970s late	Salmon	Lemhi	W of Leadore/Mill Creek	Harvest w/dogs	C	Laverne Hokanson
1970s late	Salmon	Lemhi	E of Tendoy/Cow Creek	Observation	P	R. (Doc) Smith
1970s late	Salmon	Lemhi	N of Tendoy/Kenney Creek	Tracks	P	R. (Doc) Smith
1970s mid	Salmon	Lemhi	W of Salmon/Leesburg Basin	Harvest w/dogs	C	Ray Torrey[a]
1976	Salmon	Lemhi	E of Salmon/Geertson Creek	Harvest w/dogs	C	Jerry Meyers
1976	Salmon	Lemhi	SW of Leadore/Swan Basin	Ran w/dogs	P	R. (Doc) Smith
1976-77	Salmon	Custer	NW of Stanley/Knapp Creek road	Observation	P	Ray Lyon
1976-78	Salmon	Blaine	S of Alturas Lake/Beaver Cr./Smiley Cr.	Tracks	P	Skip Schaeffer
1980s early	Salmon	Lemhi	W of Leadore/Mill Creek	Trapped 1	C	Bedford Stroud
1980s mid	Salmon	Custer	W of Challis/Mosquito Flat	Observation	P	Ron Malone
1980s mid	Salmon	Lemhi	W of North Fork/Spring Creek	Tracks	P	Larry Maxwell
1980s mid	Salmon	Lemhi	W of North Fork/Squaw Creek	Observation	P	Ron Malone
1983 July	Salmon	Lemhi	NW of North Fork/Pine Creek	Observation	P	Dick Wenger
1983-12-17	Salmon	Lemhi	SW of Salmon/Williams Creek	Trapped 1	C	No name*
1985	Salmon	Custer	NW of Stanley/Knapp-Beaver Cr.	Tracks	P	Tim Kemry
1986 Nov.	Salmon	Lemhi	Big Hole Pass	Tracks	P	Dick Wenger
1987	Salmon	Custer	S of Stanley/Fourth of July Creek	Trapped	C	Craig Rember
1987	Salmon	Custer	W of Stanley/Stanley Lake	Trapped	C	Craig Rember
1987	Salmon	Custer	W of Stanley/Marsh Creek	Trapped	C	Craig Rember
1987	Salmon	Custer	S of Stanley/Alturas Lake	Trapped	C	Craig Rember
1989 or 90	Salmon	Blaine	NW of Ketchum/Emma Creek	Tracks	P	Ken Higgs
1990	Salmon	Lemhi	W of North Fork/Spring Creek	Tracks	P	Larry Maxwell
1991-12-26	Salmon	Lemhi	SW of Leadore/Big Creek	Trapped 1	C	Raymond Whittier*
1993	Salmon	Lemhi	Lake Creek/Williams Lake	Tracks	P	Laverne Hokanson

1995	Salmon	Custer	S of Stanley/Fourth of July Creek	Tracks	P	Craig Rember
1995 Jan.	Salmon	Lemhi	S of Cobalt/Panther Creek	Tracks	P	Dick Wenger
1995-96	Salmon	Lemhi	Big Hole Pass	Tracks	P	Larry Maxwell
1996 Nov.	Salmon	Custer	Near Seafoam R.S./Rapid River	Tracks	P	Tim Kemry
1997 winter	Salmon	Custer	Near Redfish Lake/Fishhook Creek	Tracks	P	Ray Vizgirdas
1947 or 48	Southeast	Caribou	NE of Soda Springs/Trail Canyon	Trapped 5	C	Oliver Peterson
1950-60	Southeast	Bear Lake	E of Georgetown/Georgetown Creek	Trapped 1	C	Oliver Peterson
1950-60	Southeast	Bear Lake	East of Georgetown/Snowdrift Mtn.	Trapped 1	C	Oliver Peterson
1950-60	Southeast	Caribou	NE of Soda Springs/Trail Canyon	Trapped 1	C	Oliver Peterson
1950-60	Southeast	Caribou	E of Soda Springs/Diamond Creek	Trapped 1	C	Oliver Peterson
1954-55wntr	Southeast	Caribou	E of Wayan/Tincup & Stump Creeks	Trapped 2	C	Roy Keener*
1960s mid	Southeast	Oneida	Near Malad City	Trapped 1	C	Kirk Eberhard
1960-70	Southeast	Caribou	Soda Springs/Combine Hill	Tracks	P	Oliver Peterson
1972	Southeast	Bear Lake	W of Nounan/Skinner Canyon	Trapped 1	C	Jim Burghome
1973	Southeast	Bear Lake	N of Georgetown/Rattlesnake Canyon	Trapped 1	C	Johnny Hottle
1990	Southeast	Power	SW of Rockland/Dairy Creek	Trap/release 1	C	Animal Damage Control
1978 or 79	Southeast	Caribou	E of Wayan/Tincup Creek	Trapped 1	C	Troy Weeks
1966-11-23	Southwest/north half	Adams/Valley	NW of McCall/Brundage Mtn.	Harvest 1	C	No name
1971 or 72	Southwest/north half	Valley	E Deadwood Res./Bear Valley/Sock Cr.	Trapped 1	C	Roger Jackson
1978-01-27	Southwest/north half	Valley	NE of Cascade/Near Warm Lake	Trapped 1	C	George Hawkins*
1959-67	Southwest/north half?	Boise/Custer	W of Redfish Lake/Observation Peak	Harvest w/dogs	C	Harold Wadley
1996 Nov.	Southwest/south half	Elmore	W side Swanholm Peak/Swanholm Cr.	Tracks	P	Ron Sherer
1997 Feb.	Southwest/south half	Elmore	N NW side of Steel Mtn./Phifer Creek	Tracks	P	Ron Sherer
1961-64	Upper Snake	Teton	W of Victor/Patterson Creek	Trapped 1	C	Bill Scheiss
1968	Upper Snake	Fremont	Island Park Res./Icehouse Creek	Shot 1	C	Paul Valcarce
1970s	Upper Snake	Custer	S of Mackay/Trail Creek	Ran w/dogs	P	Laverne Hokanson

1970s early	Upper Snake	Custer	Near Mackay	Shot 1	C	Larry Jarrett[b]
1970s mid	Upper Snake	Fremont	Henrys Lake Flat	Trapped 1	C	Vard Wright
1970-92	Upper Snake	Fremont	Btw Island Park Res. & Henrys Lake	Tracks	P	John Stevens
1972	Upper Snake	Fremont	Henrys Fork of the Snake River	Shot 1	C	Tony Latham
1972	Upper Snake	Butte	Arco area	Shot 1	C	George Yerby
1979-01-08	Upper Snake	Fremont	Near Henrys Lake	Trap 4/release 1	C	John Stevens*
1980s	Upper Snake	Fremont	Shotgun Valley/Island Park Res.	Trapped 1	C	Kirk Buehler
1982-87	Upper Snake	Fremont	N of Ashton/Big Bend Ridge	Trapped 1	C	No name*
1982-83wntr	Upper Snake	Clark	W of Dubois/Medicine Lodge Creek	Observation	P	Brian Aber
1983	Upper Snake	Fremont	Reynolds Pass	Trapped 1	C	No name*
1986	Upper Snake	Fremont	W of Ashton	Trapped 3	C	John Stevens
1989	Upper Snake	Fremont	NE of Ashton/headwaters Warm River	Tracks	P	Bill Scheiss
1989 or 90	Upper Snake	Clark	N of Kilgore/head of Coal Mine Drainage	Tracks	P	Brian Aber
1991-92	Upper Snake	Teton	W of Victor/Patterson Creek	Tracks	P	Bill Scheiss
1992-93	Upper Snake	Teton	NE of Felt/Tepee Creek	Tracks	P	Bill Scheiss
1997 Feb.	Upper Snake	Clark	W of Island Park Res./Sheridan Creek	Tracks	P	Brian Aber
1997 Oct.	Upper Snake	Fremont	E of Henry's Lake/ridge N of Tygee Cr.	Tracks	P	Brian Aber

★Confirmed/Probable

*IDFG harvest records or historical records/checked by IDFG employee

[a] reported by Doc Smith.

[b] reported by Andy Hagel, taxidermist

[c] reported by Kirk Eberhard

[d] reported by Lester Gesel, furrier

[e] reported by Lars Eidness, furrier

Appendix C

Interviews

Name	Comment
Aber Brian, FS Biologist	In the winter of 1982-83 two local ranchers reported seeing a lynx in the Medicine Lodge Creek area. One rancher said the cat was eating the chickens in his chicken coop. The other rancher saw the lynx cross a road in the area about a week after the first report. Shortly after that sighting Brian saw the cat crossing the road. All of the sightings were within 200-300 yards of the creek. In February 1997 Brian observed 2 sets of tracks in the Sheridan Creek drainage. The tracks went into the creek bottom dipping in and out of the tree wells. He followed the tracks in the other direction and found where they had crossed and open side-hill. There were several locations with depressions in the snow, where the tracks came together, with tufts of hair in the depression. Brian speculated that this may be a male and a female (tracks were about the same size) mating. The elevation was ~7550 feet. He returned to the area about a week later and found one set of fresh tracks walking in the old tracks. This October (1997), while deer hunting on the ridge north of Tygee Creek, he came across a set of tracks at the top of an old ski hill in subalpine fir. The tracks stayed in the timber and didn't cross the large openings at the top of the ski run. As he came around the ridge he found the tracks again in a stand of white-bark pine dying from blister rust (so the canopy was very open). Above the pine stand was subalpine fir. The elevation ranged from 7875 to 8386 feet. In the winter around 1989-90 Brian saw one set of tracks, close to the divide, in the saddle between Baldy Mountain and Big Table Mountain, north of Kilgore. The elevation is ~8000 feet there.
Anderson Dick	Maintained a 345-mile snowmobile trap line between the Clearwater and the St. Joe River. He has trapped for nearly 40 years and every year he would see 3 or 4 sets of tracks. He has never seen more than one set of lynx tracks at a time and assumed they were all toms. He never found any evidence of kittens. The most likely place to still have lynx was Gold Ridge and Gold Creek. He saw tracks fairly consistently on the backside of Marble Mountain (also saw two wolf tracks here), a set in Rutledge Saddle, and up Malimute, (old lookout accessed by Avery Timber Creek Road). He saw the lynx that Cecil Samford caught and also knew of a lynx his neighbor caught. All of these lynx were caught in coyote sets. He had seen a lot of fisher tracks, and although he had tried not to catch them, occasionally one would get caught in a marten set. There were more coyotes than you can imagine in the high country and he felt that coyotes could definitely impact lynx and bobcat populations through kitten

predation. He has seen a big increase in the lion population and felt they could also be having an impact on lynx. In the spring of 1967, he unintentionally ran a lynx with hounds while hunting near Dixie, on the Salmon River breaks, just above snowline.

Although he had chased a few lynx with dogs, they never caught one.

Avery Joe

He has been trapping for years and has seen lynx sign primarily in the Priest Lake area and around the St. Joe headwaters, but has never seen any sign south of Moose Creek in the Selway Bitteroot Wilderness. Between the head of the Clearwater and the St. Joe he always sees some tracks, although he hasn't trapped there for 6 or 7 years (this was the last time he observed tracks in this area). It has been 4 years since he trapped in the Priest Lake area. The last sign he saw in Priest Lake area was one set of tracks 5 years ago, west of the lake, near Plowboy Mountain, on a mountain he thought was called Boulder Mountain. He thinks there are still lynx in the Priest Lake area and in the head of Clearwater/St.Joe. While snowmobiling two winters ago (March), he saw tracks (2 or 3 sets) in an area called Tom Beale Park, on Tom Beale Road, south of Powell. All tracks and sign were way up in the timber; never heard of or seen anything below timberline. He has spent a lot of time in the East Fork of the Salmon area, near Challis, but has never seen any sign in that area. Most of the tracks he has observed were while snowmobiling on ungroomed roads and when he snowshoed into the area between the St.Joe and the Clearwater. The tracks would cross the road but never follow it.

Baird Ray

He thought snowshoe hare numbers were declining and had reached about the lowest level he had ever seen. The snowshoe hare population in Upper Fish Creek didn't seem to fluctuate in number like jackrabbits. In 1941, 1957, 1958, 1966 and 1967 he remembers large increases in the jackrabbit population. And remembers large numbers of jackrabbits in the vicinity of Jerome, ID in the late 1960s and early 1970s.

Batchelder Bud

Mrs. Batchelder recalled hearing of a lynx that was killed along the highway near Bellevue in the early 70s. Bud said there were a lot of jackrabbits around Carey in the late 60s.

Beuller Kirk, trapper

Trapped a lynx in the Spencer-Kilgore area in the 1980s. He pointed out areas near Henry's Lake where lynx were in the past and thought some may still be in the area. He had a bobcat killed and eaten in a trap by a lynx. He didn't think that coyotes had any impact on lynx.

Blackburn Joe, trapper, sheriff, former CO*

Did most of his trapping in St. Maries Creek and Upper Marble Creek. He hasn't seen any sign of lynx in the last 10 years and doesn't think there are any lynx in that country anymore. Twenty to twenty-five years ago he would either catch a lynx or see a track once a year. He believes habitat loss, due to clearcuts and road development, is the primary factor for the

	declining lynx numbers. He also agreed that lions are probably a problem.
Burghome Jim, trapper	Trapped a lynx above his house in Skinner Canyon in 1972. He trapped 34 bobcats, but that was the only lynx he caught and had never seen any tracks. He verified that Johnny Hottle had trapped a lynx in Georgetown Canyon about the same time.
Campbell Bob, trapper	He has treed a few lynx with hounds and trapped four or five, but found them difficult to trap because they use such large areas. He caught all of his lynx, on a regular route that he snowshoed, north of Bonners Ferry on Queen Mountain Road. He said the last lynx he caught was about 1964. There were a lot more lynx 20 or 30 years ago compared to today. He attributed the lynx decline to decreased snowshoe hare numbers. And, although lynx did occasionally catch grouse, snowshoe hares made up most of the diet. He said that hares were abundant until the late 40s, when there was a large die-off from which the hare population has never recovered. He thought that the hare die-off was due to tularemia. The increase in coyotes had impacted bobcats and lynx, although not to the same extent as declining snowshoe hare populations and when the opportunity presented itself, mountain lions would also kill a lynx.
Carrick Lee, lion hunter	Has seen two sets of lynx tracks, one near Priest Lake and one near Horsehaven.
Curry Joe, IDFG	Sometime between 1972 and 1977 he checked three lynx (figured a family group) that were trapped NNW of Henry's Lake between Schoolhouse Canyon and Reynolds Pass. He hasn't seen or heard any reports of lynx since. (See John Stevens)
Daw Ken	His son shot a lynx five miles South of Hansen in 1972 in the middle of farming country. It was opening day of pheasant season and his boy saw the lynx come out of a ditch and go up the only tree in the area. The lynx was an adult female weighing between 25-30 pounds. (See Carl Nellis)
Eberhard Kirk, IDFG	During the late 1960s and early 1970s, in the Hailey area, lynx observations, road kills and trapping incidents were fairly common. He saw one lynx that was trapped near Malad in the mid-1960s. During the late 1970s he checked three lynx trapped by Cecil Samford near St. Maries.
Eidness Lars, furrier	Has seen one lynx from Idaho, caught by Charlie Harpole from St Maries; harvested in the upper end of Marble Creek Basin about 10 years ago. In the late 70s and 80s he was buying a few from western Montana and he still sees several from Canada. He thought there weren't very many hares south of Canada, and that lynx didn't have enough to eat. He had numerous people say they were bringing a lynx in for mounting but they all were bobcats. He wondered if the percentage of lynx caught was more a

	function of the intensity of bobcat trapping, similar to how otter captures relate to the number of beaver trapped. He believes lynx were never numerous in Idaho because when bobcat fur prices were high (most lynx were caught by bobcat trappers) very few lynx were trapped. He bought bobcat furs in the Salmon area (never saw or heard of a lynx fur from here) and says that many had bluish coats and believes they were mistaken for lynx.
Endicott Donny	Found one set of tracks three years ago and one set five years ago north of Tillicum Creek (in Washington) near the top of Granite Pass west of Priest Lake and one set five years ago on Granite Pass. All tracks were seen in winter while he was snowmobiling. Tracks crossed the road and did not follow it.
Garwood Robin, FS Biologist	A set of tracks was reported to her by Ray Vizgirdas (FWS biologist) and an IDFG biologist. The tracks were observed at the top of Fishook Creek in January or February of 1997.
Gesel Lester	Saw a lynx on Spruce Ridge in the North Fork of the Couer d'Alene River drainage (south of Packsaddle). Leo Black live trapped one there about 30 years ago for use in a county fair and later released it. He saw a lynx track between Trestle Creek and Lightning Creek. He said there were very few lynx and they should have been listed years ago.
Hagel Andy, taxidermist, lion hunter	Commonly saw lynx tracks in the upper Lemhi Valley while hunting cougars in the 1960's and 1970's. He recalls making two lynx rugs: one for Larry Jarrett who killed one while deer hunting near Mackay in the early 1970's and one for a Mr. Tobias who shot one that was feeding on a deer carcass in Hayden Creek in the 1970's.
Higgs Ken	Observed lynx tracks in 1989 or 1990 in Emma Creek (Blaine county) about 3-5 miles up from the Methodist camp. The lynx was heading into some very steep, rocky country and had come out of the river floodplain bottom and rolling hills with Douglas fir and aspen.
Hill Trevor, trapper	Has seen lynx tracks by the waterfalls in Falls Creek (near the S. Fork of the Snake River) for the last two to three years. He has seen an increase in the number of snowshoe hares in the last 4 or 5 years.
Hokanson A. Laverne, trapper	Caught two lynx, with dogs, one in McDevitt Creek in the 50s, and one in Mill Creek in the late 70s. He saw 2 sets of tracks in Lake Creek above Williams Lake in 1993, and one set in Diamond Creek about the same time. Once in a great while, when he was guiding hunters, he would see a lynx track in the area around Squaretop Mountain. He turned hounds loose on three lynx he didn't catch; one along Trail Creek, west of Mackay, near Trail Creek summit in the 1950s, one in Summerhouse Canyon

(Pahsimeroi Valley) in the '60s, one near Tobias Creek in the '70s. The lynx spent most of the time at very high elevations but, occasionally, they would come down into the willow bottoms in the Lemhi Valley and that is where his hounds would cut their tracks. He said the most consistent place for finding lynx was Mill Creek around Mill Lake, Apple Creek, Big Eightmile, and Hayden Creek. He didn't run his dogs up the Lemhi very much because several trappers were snaring coyotes and 1080 was being used. They still have snares and traps set up at the mouth of all the canyons to catch bobcat; he has lost two dogs in snares in the last 2 or 3 years. Gary Tracy and his brother catch about 50 bobcats annually.

Hottle Johnny, trapper

Trapped one lynx in Big Rattlesnake Canyon in 1973. He was aware of the one Jim Burghome trapped. (See Jim Burghome)

Jackson Roger, trapper

Trapped a lynx in Bear Valley near Sack Creek about 25 years ago (1971or 1972). Suggested calling Jimmy Inama and Lynn Davis.

Jebson Delbert, trapper

Trapped a lynx in 1990 up Granite Creek, near Zero Creek, on the flats along the creek in the timber. Trapped it within 100 feet of the hardest used snowmobile trail in northern Idaho (had been there for about 2 weeks eating on a carcass). It was a huge tomcat weighing in at 57 pounds. It had very few teeth left and IDFG took the skull. Saw tracks 2 years ago in this area and almost every year prior to this. Around Petit Lake, Willow Creek, and Zero Creek he has seen 2 sets of tracks. He thinks there are 2 animals, but when the snow gets deep, they move out. He thinks that in areas where there are lynx, bobcats aren't able to make it. And, has seen lynx and bobcat tracks together only once, last year in deep snow along the Middle Fork of the East River in the bottom where the deer winter. In Trapper Creek, up at the top, he saw tracks 2 years ago, and each year prior to that in the old burn. He has been seeing tracks consistently for 16 or 17 years and hasn't noticed any change in the numbers in that time. All sign was seen while snowmobiling. The tracks usually crossed the road, never go down it, although they might parallel it. Ted Holdman was the FG in Washington who did the study, and the study was done near the Idaho – Washington border.

Keller Bud, trapper

Has never seen a lynx but said his father-in-law had trapped a few in the 30's and 40's in Caribou County.

Kemry Tim, trapper

Observed a set of lynx tracks following an old trail along the Middle Fork of the Rapid River in November (1996) where Opal Creek runs into the Rapid River. The habitat was Douglas fir with spruce pockets. He also saw a set of lynx tracks in 1985 in Beaver Creek (18 miles from Cape Horn). He suggested checking, The Beaver, a Hudson Bay Co. publication, (U of ID) but wasn't sure if they differentiated between bobcat and lynx.

Latham Tony, IDFG	Harvested a lynx while hunting ducks along the Henry's Fork of the Snake River in 1972.
Lyon Ray, IDFG	Checked a lynx that had been trapped in Stanley Basin in the winter of 1969-70 and saw a lynx on the road going up Knapp Creek in the winter of 1976-77.
Malone Ron, outfitter, hound hunter	While hunting with dogs in the Mosquito Flat area (west of Challis) in the mid-1980s, he observed three lynx over a three to four year period. He also reported a lynx observation in Squaw Creek (upstream from Challis).
Maxwell Larry, trapper, taxidermist	Has trapped the North Fork area since the 1950s, and also trapped in Alaska. He trapped two lynx at the mouth of Clear Creek, tributary to lower Panther Creek, in the 1960s. Remembers fewer than 12 lynx trapped or killed in Lemhi County during his lifetime. Saw tracks of several lynx on ID/MT divide at the head of Spring Creek in the mid-1980s. Also saw tracks there while trapping marten in 1990, but has seen no tracks in that area the past two winters. Trapped a young lynx near Jureano Mountain, near head of Moose Creek in 1987 and released it. Observed the tracks of two lynx in the Bighole Pass area during 1995 and 1996. These two lynx are the only two he is aware of in the North Fork area at this time. He has noticed a definite correlation between lynx track observations and snowshoe hare abundance. Has observed sign of cougar predation on lynx. He believes that lynx will change areas of use when disturbed by repeated snowmachine traffic.
McPherson Don, retired CO*	He chased but never caught a lynx up in the top of Hughes Creek near the Twin Creeks Campground. In March about 25 years ago, he saw a road-killed lynx at No See Um Creek on Highway 12 above the old ranger station. He use to snowmobile from the Red River Ranger Station to Darby a couple of times a winter and always saw tracks at Horse Heaven Cabin in Kim Saddle, on the McGruder side. This is the lowest pass between the Salmon mountains and the Selway. He made these trips every winter from 1960 – 1980. Fisher were reintroduced in the 60s and from then on you saw more fisher tracks than lynx. The lynx tracks were found with snowshoe tracks, usually on a mistletoed fir slope. He has never seen any coyote/lynx overlap in range. Coyotes may have scavenged off of cat kills, but mostly were in the river bottoms.
Melquist Wayne, IDFG	Has a photographic slide on file of a lynx harvested near Jerome, ID in 1972. (See Stu Murrell)
Meyers Jerry, district judge, hound hunter	Treed and killed a lynx in Geertson Creek in 1976 and sold the pelt for $80. Saw and pursued a lynx in Swan Basin while cougar hunting with Doc Smith in 1976. He said there were "lots of jackrabbits" during the mid-1970s in Lemhi County.

Murrell Stu	A lynx was shot east of Jerome near a cattle feedlot on the West side of the highway between Eden and Hazelton. Ted Chu might have some additional information. Also, he said there was a USFWS station in Twin Falls that studied the interactions between jackrabbits and coyotes for several years, but closed about 4 years ago. He remembers jackrabbit population increases in 1972, 1983, and 1993. (See Wayne Melquist)
Nellis Carl, IDFG	Confirmed a lynx that was harvested in the Magic Valley (pelt displayed in Daw's IGA in Hanson, Idaho). He researched lynx, coyote, and snowshoe hare interactions in Alberta during the early '60s. He observed classic lynx cycles and flattened coyotes cycles when snowshoe hare numbers declined. Coyotes consumed a variety of prey during snowshoe population declines. He found some lynx with porcupine quills in their forearms. (See Ken Daw)
Pentsky Bruce, IDFG	Checked a lynx that was harvested near Big Bend Ridge approximately 10-15 years ago (1982-87). Big Bend ridge is an area of interface between sagebrush and conifer/aspen (near Ashton Hill and Sand Creek Wildlife Mangement Area).
Peterson Oliver, trapper	Began trapping in 1945 and did most of his trapping in the 50s and 60s. In 1947 or 1948 he caught five lynx in Trail Canyon, 10 miles NE of Soda Springs, in one week. He caught four other lynx in the 50s and 60s; one just out of Trail Canyon on the Soda Springs side, one in Diamond Creek, one near Georgetown, and one on Snodrift Mountain, east of Georgetown. The habitat consisted of a mosaic of aspen, conifer, and mountain brush for all except the lynx he trapped on Snodrift Mountain, which was near timberline. The last set of lynx tracks he saw was in the late 60's or early 70's near Combine Hill (Soda Springs archery range). He estimates there were 4 or 5 animals on Combine Hill. He said he never saw bobcats and only rarely saw coyotes in areas occupied by lynx in the winter. He said he thought the lynx relied mainly on snowshoe hares. He didn't recall any of the lynx having porcupine quills in their legs, but has caught bobcats that did. He said when they started using 1080 (~1947) on coyotes the deer numbers increased. After about 5 or 6 years the coyote populations begin to make a comeback. Commented he noticed an increase in bobcats about 1950 and when there were a lot of bobcats there were few coyotes and vice-versa. He remembered in the late 60s and early 70s jackrabbits were plentiful in the basins between mountain ranges. He ran his trap lines with snowshoes and cross-country skis and although the road density is about the same now as then, access is easier because of snowmobiles and ATVs. When asked to speculate on the demise of the lynx in his area, he thought it was due to the lack of snowshoe hares and increased access into the areas by snowmobiles and ATVs. He had never seen any sign of lynx in the mountain range west of Bear Lake. He knew Roy Keeler (See Roy Keeler)

	and guessed that the lynx that Roy caught were near Tincup Creek or Stump Creek.
Prentice Pat	He is out in the country around Priest Lake a lot and has never seen any positive lynx sign in Idaho. He doesn't think that there are very many left.
Rember Craig, trapper	Two years ago he saw 3 – 4 sets of tracks in heavy timber up Fourth of July Creek. There was always a pair of tracks in there each year and also near the lower end of Stanley Lake, up in the trees. Ten years ago he caught one lynx at the top of the Fourth of July Creek drainage, one at the lower end of Stanley Lake, one in the narrows of Marsh Creek, and one at Alturas Lake. He has spent a lot of time in the East Fork of the Salmon (cougar country) and he never saw a lynx there. He says that lynx rely on snowshoe hare but would eat any rabbit they could catch. Hasn't seen any bobcat in a long time, there were never many around Stanley because of the hard winters and lack of rabbits. He thinks that coyotes would go for the cats if they could catch them. The fox really don't affect lynx. The headwater of the Big Lost River, over Trail Creek, is good fur country. And, there is a lot of high country around Mackay with lots of rabbits. Lynx like heavy timber and around Ashton there is good timber. Lynx probably move and migrate through the sagebrush. A mountain goat was seen in a hayfield at the M-M ranch near Elk Creek this summer. They must just want to explore and move a little sometimes. There are not many trappers left and most are after marten and beaver now. Nobody would be out now if it weren't for the snowmobiles. Snowmobiles are everywhere now; some of the elk wintering grounds are out of bounds to keep them from harassing the elk. They get more popular every winter.
Schaeffer Skip	Observed two sets of lynx tracks in Beaver Creek in 1976-78. The tracks crossed Beaver Creek one day and Smiley Creek the next. He thought that snowshoe hare populations were on the upswing as were the jackrabbits.
Scheiss Bill, trapper	He trapped for bobcat and lynx in the Teton Valley and pine marten around Ashton. He last saw one set of lynx tracks during the winter 4 or 5 years ago near Felt, Idaho, on Jackpine Loop, just this side of the Wyoming – Idaho line, close to Yellowstone, up Teepee Creek. It was in the lower part of the drainage, but still in the timber. From 1972 through 1982 he trapped around Jerome and saw numerous bobcats, but never any sign of lynx. Five or 6 years ago west of Victor, in the head of Patterson Creek, up in the top of the drainage, he saw two sets of tracks. His father, William A. Scheiss, was a government trapper between the 1930s and 1960s and he trapped lynx in the Teton Valley (start at Piney Pass and circle the valley each week). He caught several lynx in upper Patterson Creek from 1961 – 1964. They killed the bobcats and coyotes, but they would muzzle the lynx and bring them home on a packhorse, tie them up to a tree and feed them

	until their coats were nice. These were adult lynx. Bill has seen more wolverine tracks recently than lynx and did see wolverines where Warm River comes out of the mountains at the headwaters NE of Ashton. There were lynx tracks there in 1989. He hasn't trapped for 4-5 years so he usually sees sign when snowmobiling. The tracks almost always cross the roads, and rarely follow the road. In the last 5-6 years, he has seen 2 sets of quite large tracks in Patterson Creek. He thinks that lynx and bobcat numbers are down partly due to coyotes. Ten to15 years ago there was a lot of sign compared to now.
Scholls J.R.	Observed a lynx while duck hunting one mile West of Milner Dam along a canal in the early 70s.
Sedlak Adam, trapper, taxidermist	Worked for taxidermist, Larry Maxwell, and trapped. Did not recall ever trapping a lynx or mounting or tanning a pelt.
Sherer Ron	Observed 2 sets of lynx tracks three miles up Swan Home Creek (Middle Fork Boise River) from the main road between milepost 51 and 52 in November (1996). In February 1997, he saw tracks directly across from Swan Home Creek up Phifer Creek, ½ mile off Middle Fork Road. About 10 years ago, he saw a set of lynx tracks in Nacomas Meadows between Green Creek and Peasley Creek (South Fork of the Clearwater). Also, while guiding out of the Shep Ranch, he saw a set of lynx tracks up Sheep Creek on the N. Side of Salmon River, 7 or 8 miles below Shep Ranch.
Smith R.J, trapper, rancher	Trapped a lynx at the mouth of Baldy Creek, tributary to the Lemhi River in 1952. He saw a lynx cross Highway 75, near the turnoff to Redfish Lake, in the Stanley Basin, in 1966.
Smith Richard (Doc), dentist, lion hunter	Saw a lynx (chased it with hounds, but did not tree it) in Swan Basin, upper Lemhi River, in 1976. Also, saw a lynx in Cow Creek, tributary to Agency Creek, in the late 1970s. He frequently observed lynx tracks while cougar hunting in Kenny Creek area during the late 1970s and early 1980s. Recalled a newspaper picture showing Ray Torrey with a lynx his hounds had treed in the Leesburg Basin area in the mid-1970s. He saw the lynx that Laverne Hokanson killed in Mill Creek, tributary to the Lemhi River, in the late 1970's.

Stevens John, Sawtell Mtn. Radar technician, trapper	He trapped four lynx (Sawtell area) in the mid-70s, harvesting three sub-adults and releasing an adult female. At the time the snowshoe hare population was high, as were jackrabbits. They would use jackrabbits for baiting the lynx. In 1986 he harvested three lynx (from a group of 4 or 5) West of Ashton in the Five Monuments area. One was an adult female and the other two were juveniles that were old enough to hunt. He said they appeared to be hunting jackrabbits, which were very numerous at that time. He observed one or two sets of tracks in the Sawtell area every year until 1992 when he retired. In the areas frequented by lynx in the wintertime there were no bobcats or coyotes, but there was an occasional mountain lion. Many of the areas where he observed lynx sign have been logged and he hasn't seen any sign since then. He thought clearcutting and slash burning affected snowshoe hares, red squirrel, marmot, grouse, and chipmunk by decreasing the available food and by eliminating slash piles used for cover and winter hibernation. This in turn would reduce the available prey species for marten and lynx. He suggested that pikas were a fairly important food source for lynx in the summer as well as grouse and squirrels, although not as important as snowshoe hares. He believed that lynx travel long distances, and when they found high concentration of rabbits (snowshoes or jackrabbits), they would remain in the area until the food source was depleted. He though that coyotes and fox were increasing in the desert around St. Anthony.
Stroud Bedford, trapper	Trapped four lynx in the upper Lemhi River drainage (Lower Mill Creek, Tex Creek, Hawley Creek, and along the Lemhi above Leadore) between the late 1960's and early 1980's. The last one he trapped was on Mill Creek in the early 1980s. All captures were incidental to bobcat trapping (trapped 134 bobcats one year during the late 1960s in the upper Lemhi River drainage and sold the pelts for $6.25 each). Bobcat numbers would peak during jackrabbit population peaks. He thinks coyotes kill young bobcats and lynx; there were very few coyotes in the Lemhi Valley prior to the ban on 1080, however bobcats were numerous. Since the post-1080 increase in coyotes he has not observed or trapped many bobcats.
Tredowsky Frank, taxidermist	Never had a lynx come through his shop. Most of the time people who claimed to have caught a lynx actually caught a bobcat.
Wadley Harold, former district ranger, Stanley	He worked in Stanley from 1959 to 1967. He estimated that there were about 15 lynx on the breaks of the Sawtooths from Alturas Lake to Heyburn Lake. He observed lynx on the breaks of Grand Jean and down into Cape Horn Meadows but never on the Seafoam side down into the Middle Fork of the Salmon. He also made lynx observations in the White Clouds, south of Clayton (above Robinson Bar) and along the East Fork of the Salmon, north of Clayton in Squaw Creek and in Basin Creek. He didn't hunt the White Clouds as much as the Sawtooths because of distance from Stanley and the greater risk of avalanches. He found a den site in Iron

	Creek basin, above a trail between Iron Creek and Redfish Lake, on the south side of a ridge with big boulders, gnarly Douglas fir, bluebunch wheatgrass, and sagebrush. The den was at the base of a big boulder and Douglas fir tree. He saw kitten tracks at the den site about every other year and once he walked near enough to see two kittens sunning on a rock. He said the kittens were usually born in May when the north slopes were still completely snow covered and south slopes were patchy with snow. He found that the kittens would stay with the female until the winter of the following year and then disperse. When the lynx were traveling they would line out along a ridge, but when hunting they were all over the place. Although snowshoe hares made up the bulk of their diet, he found that lynx would catch voles, pine squirrel, porcupine and an occasional grouse. He said the snowshoe hare numbers varied from year to year and for several years the density was quite low. Every lynx he harvested had porcupine quills in their forearms and the wounds from the quills were callused and completely healed. There were a lot of porcupine at that time; the lynx would reach under the porcupine (when on snow), flip them over, then eat the "middle" out of the porcupine. They didn't eat the hams or legs just the stomach area. He harvested (with dogs) seven lynx; one from Alturus Creek, three from the area between Redfish Lake and Iron Creek, one from Observation Peak, one from Iron Creek, and one from Stanley Creek. He also treed lynx in Basin Creek. Lynx would readily swim the river above Basin Creek. He stopped running lynx with his dogs once the local trappers figured out he was finding lynx. The trappers harvested 10 lynx in a short period of time. The first couple of years he was in Stanley there were no snowmobiles and most of the trappers did not snowshoe into where the lynx were. He saw one wolf near Seafoam and only one coyote and three bobcats in the seven years he was in Stanley. He thought that mountain lions were having an impact on lynx. He has seen two or three different sets of lynx tracks in the head of Marble Creek, toward Homestead, since he moved to St. Maries (after 1958).
Weeks Troy, trapper	His Dad caught one lynx in Tincup Creek around 1978 or 1979 but he hadn't seen or heard of a lynx sighting or tracks for about 10 years. He thought there could still be lynx in Rainey Creek. All of the bobcats and lynx they harvested had porcupine quills in their stomach. He thought the increase in mountain lions has influenced the decline of bobcats and lynx, and didn't think coyotes had any impact.
Wenger Dick, USFS	Observed lynx tracks on the Continental Divide, one mile north of Big Hole Pass in November 1986 and in Upper Panther Creek, near mouth of Cabin Creek, in January 1995. He observed a lynx in the Pine Creek drainage during July 1983.
Will Gary, IDFG	Remembered hearing of a road-killed lynx near Carey, ID around 1972.

Williams Dave, outfitter, hound hunter	Reports three lynx observations, all in the early to mid-1970s. Observed a lynx crossing the road in upper Lick Creek, tributary to the North Fork of the Salmon River. Saw tracks near the Continental Divide in Agency Creek and in Patee Creek, both tributaries to the Lemhi River.
Wright Vard	Made a head mount of a lynx (trapped on Henry's Lake Flat by coyote trappers) in his taxidermy shop over 20 years ago (probably mid-70s).

*Conservation Officer

Individuals interviewed who had no information relative to lynx. It should be noted that no information from knowledgeable individuals is valuable information.

5/20/1997 **Don Wright (525-7290), Idaho Falls, IDFG**.

5/30/1997 **Blake Phillips (847-2005), Montpelier, IDFG**.

6/1/1997 **Warren Moore (547-3462), government trapper (retired), Soda Springs** - had never trapped or seen a lynx track in his tenure (20 years) as a trapper.

6/5/1997 **Lyle Scheiss, (787-2468), trapper, Teton**.

6/9/1997 **Al Nicholson (525-7290), IDFG CO.**

5/30/1997 **Dean Michaelson (945-2052), trapper, Paris** - Has been trapping since the late 50s and has never run across any lynx. Caught a lot of bobcats early on, but thinks hound hunters and coyotes has killed most bobcats.

Highways

History

Like many other western states, the outline of Idaho's highways were worn by nature, animals, native Americans, explorers, trappers, miners, soldiers and homesteaders. The design of the state highway system, completed in 1916, became the basis for Idaho's highways as they exist today (Erickson 1985). There were already 8,000 miles of main roads by 1914; 18% (1,400 miles) were included in the proposed state highway system. By 1930, 4,500 miles of state highways were built and nearly a fourth (1,000 miles) were paved. This rate of development was made possible by the advent of motorized equipment. The number of miles surfaced, i.e. paving and graveling, continued to increase through the 30's and 40's. By 1950, there were 5,128 miles of highways in the state system and 3,600 of those were paved. The total miles of highways under state jurisdiction has not increased since 1951, however, continual improvements such as realignment, grading, widening, and rebuilding of highways have been made. By 1974, 90% of the Interstate system was in four lane freeways with access only at interchanges. Although the number of highways under state jurisdiction has not increased since the 1950's, the total mileage of public roads in Idaho has increased over 60%. The mileage of public roads was calculated at 38,620 in 1950, 53,483 miles in 1968, and 62,291 miles of public roads in 1996 (Erickson 1985, Idaho Department of Highways 1969, U.S. Department of Transportation 1997).

The mission of the Idaho Transportation Department, "is to provide high quality, cost-effective transportation systems that are safe, reliable and responsive for the economical and efficient movement of people and products." The majority of travel in Idaho occurs on the 4,952 miles of highways and Interstates managed by the Idaho Transportation Department. Cities, counties and the highway districts manage additional highway miles. Motor vehicle registration in the state has exceeded the growth in the state's burgeoning population (Table 1). Increasing populations, tourism and recreation in Idaho have led to elevated traffic levels on the highways, interstates and public roads.

Table 1. Idaho's vehicle registration and population statistics

1910	460	10	470	325,594
1920	46,611	4,250	50,861	431,866
1930	104,625	15,538	120,163	445,032
1940	130,024	36,537	166,561	524,873
1950	196,410	75,322	271,732	588,637
1960	256,252	117,362	373,614	667,191
1970	314,662	171,137	485,799	713,015
1980	513,256	318,007	831,403	944,127
1990	618,868	430,845	1,049,713	1,006,749

Data complied from US Depts. of Transportation and Commerce

With few published studies on lynx populations in the western U.S., the effects of roads are inferred from radio telemetry studies and observations in Washington, Montana, Minnesota and New York. Additional data have been gathered from studies in both Canada and Europe where lynx populations are at historic lows. We can also deduce the possible effects of roads on lynx from studies on other animals. The effects of highways and roads on lynx can be separated into the following four categories: direct habitat loss from roads, highways, and associated human developments; indirect habitat loss from displacement and avoidance; human-caused mortality; and, habitat fragmentation.

I. Direct Habitat Loss

The development of Idaho's transportation infrastructure has drastically altered the landscape and environments. Roads and highways permanently replace natural habitats available to wildlife. The width of a typical highway lane is 12 feet with paved shoulders varying from 0-16 feet. Rights of ways can be up to 300 feet. The Council of Environmental Quality reported that each mile of interstate alters up to 48 acres of land (1974). This would amount to approximately 29,000 acres of land in Idaho. State/US highways (4,340 miles), rural/urban arterials and collectors (8,888 miles) and remaining rural/urban roads (45,835 miles) calculated at half this amount equates to 1,417,512 acres. Overall, roads and highways alter an estimated 1.5 million acres, or approximately 3% of Idaho's landmass. Additionally, rest areas, visitor centers, historical sites, and maintenance shelters increase the area effected. Land acquisition along highways and interchanges for commercial and residential property is a common occurrence accounting for even more habitat loss. Public roads in rural areas permit invasion into previously undisturbed areas, allowing accessibility for permanent dwellings, recreational homesites, recreational lodges and shelters.

The degree to which direct habitat loss affects wildlife varies according to species mobility and habitat requirements. Direct habitat loss due to roads, highways, and associated developments may destroy key foraging areas for lynx. This would be especially important when prey populations are declining and lynx often concentrate their foraging efforts in areas of high quality prey habitat (Ward and Krebs 1985). Thus, new roads and developments could isolate or eliminate prey populations and in some cases prompting lynx to expand or abandon their home range. This may make it more difficult to meet energetic requirements.

II. Indirect Habitat Loss

Indirect habitat loss due to displacement and avoidance is difficult to quantify but has been documented for some species. Displacement of lynx by bobcats *(Lynx rufus)* occurred on Cape Breton Island following the dispersal of the bobcats on the island in 1955 (Parker et al 1983). In the Idaho panhandle area, at least three trappers attributed increasing coyote densities and their expansion into the high country as a possible cause to the subsequent decline of lynx sightings. Some speculated coyotes displaced lynx and even preyed on kittens (Idaho Interviews, 1997). Roads and trails maintained for winter recreation, pack down snow which may allow competitors, e.g., bobcat, cougar (*Felis concolor*) and coyote (*Canis latrans*), access to previously inaccessible areas (Koehler and Aubry 1994). The Panhandle National Forests in northern Idaho experienced huge increases in roads from 1960 through the mid 80's when an estimated 300 miles of new roads were built per year (John Neirinckx pers. comm). As timber sales dropped road building decreased abruptly. Currently they build 10 - 20 miles of roads per year and obliterate or close many unneeded roads following a no net increase in forest roads policy. Caution should be used when looking at road inventories because of changing definitions and because some roads are user created and are left undocumented. A recent inventory of all roads in Targhee National Forest documented an additional 102 miles of "non-system" roads (Dale Pekar pers. comm.).

Indirect habitat loss due to avoidance of roads has been documented for a variety of large mammals (Frederick 1991). Evidence from a grizzly bear (*Ursus arctos*) study by McLellan and Shackleton (1996) demonstrated that bears used habitats within 100m of roads less than expected. This amounted to a habitat loss of 8.7% in the area available to the bears. Bobcats avoided paved roads, suggesting alterations in movement patterns, in a study by Lovallo and Anderson (1996). Avoidance behavior was correlated to vehicular traffic levels and habitat composition of buffer zones around roads (Lovallo and Anderson 1996). Other avoidance behaviors could be attributed to increased human activities and structures associated with roads. In a study conducted near a busy ski area access road, there were 15 recorded crossings of lynx, half of which entailed aborted attempts before successfully crossing the road (Gibeau and Heuer 1996). After an aborted attempt, lynx typically retreated into thick roadside vegetation to bed for a period before reattempting the crossing. Roadside vegetation may be a requirement in order for lynx to successfully cross traveled roads.

Information on displacement and avoidance due to highways is less known. In one study, lynx were documented paralleling the Trans Canada Highway fence (Gibeau and Heuer 1996). Winter tracking in this area has shown a tendency for lynx to travel around the end of the fence to cross the highway and not use the culvert underpass. In some cases, this resulted in a 9 kilometer detour. Wolverines and other large carnivores tend to have home ranges that parallel highways rather than extend across them (Copeland as cited by Ruedigar 1996).

Lynx are reclusive, seldom seen animals. Increased human activity may decrease the amount of habitat available to them due to direct habitat loss or indirectly from displacement and avoidance. The avoidance behavior of lynx may be exacerbated when road sides have been cleared of vegetation.

III. Human-Caused Mortality

Direct mortality from highway accidents could be detrimental to lynx populations because of their large spatial requirements, low reproduction rates and their high pre-dispersal mortality. In areas of low hare densities in the U. S., studies have shown inflated home ranges areas from 2 to 10 times greater than averages in Canada (Mech 1980 and Koehler and Aubry 1994). In addition, long range movements of dispersing lynx have been associated with decreasing availability of prey (Ward and Krebs 1985, Mech 1980 and Koehler and Aubry 1994). In southwestern Yukon, lynx became nomadic in an area where hare densities dropped below 0.5 hares/ha (Ward and Krebs 1985). In Idaho, where preferred prey is often relatively scarce, the above factors may increase the potential contacts between lynx and roadways. With small population sizes, any mortality from road accidents could be considered a significant impact to population viability. In Minnesota, Mech documented road mortality of lynx to be the leading cause of known mortality (1980). A reintroduction of lynx in the Adirondack Mountains was a failure mainly due to the mortality caused by roads. Road kills were the leading cause of death, 18 out of 37 recorded mortalities (Brocke et al. 1990 as cited in Weaver 1993). In Spain, 63% of the calculated annual mortality rate for Iberian lynx was directly related to human activities (Ferrares 1992). Accidental illegal trapping was the leading cause of mortality, 42%, while roads accounted for 21% of the annual mortality rate. Human activities were also the main cause of death of lynx in Switzerland where 18 mortalities were due to traffic accidents and 16 were shot (Kaczensky 1991 as cited in Brietenmoser 1993). In Brietenmoser's study (1993), of 7 adults monitored, a car killed 1 and hunters shot 2. They concluded, "If the turnover is too high because of human-caused mortality and, additionally, the total number of animals is small, the population might not be able to survive in the long run." Anecdotal information from Appendix C documents several road-killed lynx in Idaho.

Vehicle accidents involving wildlife are recorded along interstates, U.S. and state highways in Idaho if the damage to the vehicle is over $750. There was an increase in wildlife related accidents in 1996 concurrent with the increased speed limit on most highways and state roads (Table 2). Increased traffic flows and speeds in Idaho in recent years appear to affect the number of wildlife related accidents (Tables 3). Ruedigar (1996) hypothesized that "as the standard of the road and the associated traffic level increases - the impact on carnivore populations also increases". Increasing speed limits could also be added to his hypothesis.

Table 2. Number of accidents in Idaho involving wildlife causing damage in excess of $750

1987	221	9	10	3	0	243
1988	257	11	15	3	1	287
1989	308	11	17	5	2	343
1990	327	7	10	5	2	351
1991	311	9	4	8	0	332
1992	357	10	16	11	0	394
1993	277	6	8	1	0	292
1994	231	37	45	5	1	319
1995	218	27	40	7	0	292
1996	371	27	16	8	0	422

1 Property damage greater than $750 & reportable-accident involving collision no injury to person

2 Possible Injury - Any injury reported or claimed which is not a fatal injury

3 Visible Injury - Any injury, other than fatal, which is evident to observers

4 Serious Injury - Any injury, other than fatal, which prevents the person from daily activity.

5 Fatal Injury - Any injury which results in the death of a person.

In the above table "wildlife" are not differentiated by species, however, we could assume that most of the reported wildlife accidents involve deer or elk. If a lynx/vehicle accident were to occur, it would most likely result in the death of the lynx and minimal damage to the vehicle.

Table 3. Average daily traffic as expressed by the number of vehicles per day on various highways.

Year	**Lolo Pass U.S. 12**	**Monida Pass I-15**	**Lost Trail Pass U.S. 93**	**Targhee Pass U.S.20**	**Teton Pass State 33**	**near Stanley State 21**
1959	n/a	530	300	815	275	50
1965	350	510	530	1150	300	160
1971	490	660	610	1260	540	450
1977	550	1300	800	1440	650	780
1983	700	1280	860	1650	720	770
1989	800	1700	740	2180	1100	500
1996	1100	2300	680	2700	2800	1100

Roads and highways augment accessibility into remote areas. They may indirectly contribute to mortality by allowing people easier and faster ways into the backcountry. Although it is illegal to purposely trap or hunt lynx in Idaho, incidental or illegal trapping or hunting is a threat to populations. Roads and highways result in access to prey populations that can be impacted by both legal and illegal hunting and other direct highway induced mortality factors.

IV. Fragmentation

Roads and highways alter the landscape by bisecting large tracks of land, some of which were previously homogenous habitats. The measure of road density may be one way of describing the degree of fragmentation in an area from roads. Species have different sensitivities to road densities. Drawing upon studies of road densities and their effects on wildlife, Forman and Hersperger described a trend of threshold effects for different species (1996). They concluded that road densities of approximately .6 km/km^2 or 1.0 mi/mi^2 appeared to be the maximum to have a naturally functioning landscape containing sustained populations of large mammals like wolves and mountain lions. Other species' declines have been linked to road densities, including (but not limited to) grizzly bear, elk (*Cervus canadensis*), moose (*Alces alces*), and white-tailed deer (*Odocoileus virginianus*) (Frederick 1991, Crete et al. 1981, Sage et al 1983). Forman and Hersperger suggest that road density effects are in reality the sum of more specific variables, e.g., for black bear (*Ursus americanus*) it is the increased human access provided by the roads and the degree of connectivity among roads. There are various reasons why affected species cannot tolerate high road densities.

Fragmentation from highways may result in a barrier effect which could effectively isolate populations. Lynx do not like to cross openings greater than 300 ft. (Koehler and Brittel 1990). Many miles of highways in Idaho are bordered by private land, and/or paralleled by county roads, railroads, and reservoirs further increasing the barrier effect. Moreover, the highways in Idaho typically follow natural corridors such as rivers and valleys which naturally fragment the landscape.

Summary

Direct habitat loss due to highways appears significant for both lynx and lynx prey populations. Indirect habitat loss for lynx from displacement and avoidance magnifies this loss. Human caused mortality from roads or incidental harvesting could be considered additive. Habitat fragmentation from roads further reduces suitable habitat for both lynx and their prey. Finally, highways fragmenting the landscape could potentially act as barriers between smaller populations. Resultant inbreeding would result in a reduction of genetic diversity and increased likelihood of species extinction.

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